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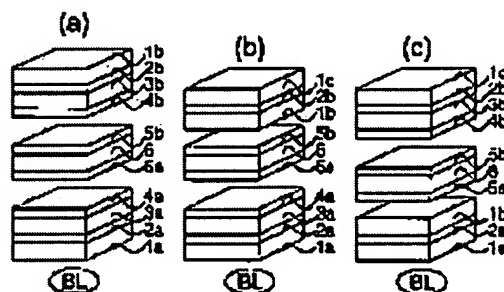
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(54) OPTICAL COMPENSATION SHEET, ELLIPTICAL PLATE, AND LIQUID CRYSTAL DISPLAY DEVICE

(57)Abstract:

PROBLEM TO BE SOLVED: To make accurately optically compensable by imparting optical uniaxial or optical biaxial property to a transparent supporting body and aligning discotic liquid crystal molecules in a state having a specified average tilt angle between the disc faces of the discotic liquid crystal molecules and the transparent supporting body.

SOLUTION: A transmission type liquid crystal display device as an example consists of, in order from the back light BL side, a transparent protective film 1a, a polarizing film 2a, a transparent supporting body 3a, an optical anisotropic layer 4a, the lower substrate 5a of a liquid crystal cell, rodlike liquid crystal molecules 6, the upper substrate 5b of the liquid crystal cell, an optical anisotropic layer 4b, a transparent supporting body 3b, a polarizing film 2b, and a transparent protective film 1b. The transparent supporting body and optical anisotropic layer (3a to 4a, 4b to 3b) form an optical compensation sheet. In this case, the transparent supporting bodies 3a, 3b used have optical uniaxial or optical biaxial property. The discotic liquid crystal molecules



are aligned at $<5^\circ$ average tilt angle between the disc faces of the discotic liquid crystal molecules and the faces of the transparent supporting bodies 3a, 3b.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Industrial Application] This invention relates to the optical compensation sheet which has the optical anisotropy layer formed from the liquid crystallinity molecule, and the elliptically-polarized-light plate and liquid crystal display using it.

[0002]

[Description of the Prior Art] A liquid crystal display consists of a liquid crystal cell, a polarizing element, and an optical compensation sheet (phase contrast plate). In a transparency mold liquid crystal display, the polarizing element of two sheets is attached in the both sides of a liquid crystal cell, and the optical compensation sheet of one sheet or two sheets is arranged between a liquid crystal cell and a polarizing element. In a reflective mold liquid crystal display, it arranges in order of a reflecting plate, a liquid crystal cell, the optical compensation sheet of one sheet, and the polarizing element of one sheet. A liquid crystal cell consists of an electrode layer for applying an electrical potential difference to two substrates and cylindrical liquid crystallinity molecule for enclosing a cylindrical liquid crystallinity molecule and it. A liquid crystal cell is the difference in the orientation condition of a cylindrical liquid crystallinity molecule. About a transparency mold TN (Twisted Nematic), IPS (In-Plane Switching), FLC (Ferroelectric Liquid Crystal), OCB (Optically Compensatory Bend), STN (Supper Twisted Nematic), VA (Vertically Aligned), About ECB (Electrically Controlled Birefringence) and the reflective mold, various display modes like TN, HAN (Hybrid Aligned Nematic), and GH (Guest-Host) are proposed.

[0003] The optical compensation sheet is used with various liquid crystal displays, in order to cancel image coloring or to expand an angle of visibility. As an optical compensation sheet, the extension birefringence polymer film was used from the former. Replacing with the optical compensation sheet which consists of an extension birefringence film, and using the optical compensation sheet which has the optical anisotropy layer formed from the discotheque liquid crystallinity molecule on the transparence base material is proposed. Since there were various orientation gestalten in a discotheque liquid crystallinity molecule, the conventional extension birefringence polymer film enabled it to realize optical property which cannot be obtained by using a discotheque liquid crystallinity molecule.

[0004] The optical property of an optical compensation sheet is determined as the optical property of a liquid crystal cell, and a concrete target according to the difference among the above display modes. If a discotheque liquid crystallinity molecule is used, the optical compensation sheet which has various optical property corresponding to a display mode with various liquid crystal cells can be manufactured. With the optical compensation sheet using a discotheque liquid crystallinity molecule, the thing corresponding to various display modes is already proposed. For example, the optical compensation sheet for liquid crystal cells in TN mode has a publication in each specification of JP,6-214116,A, a U.S. Pat. No. 5583679 number, said 5646703 numbers, and the German patent official report 3911620A No. 1. Moreover, the optical compensation sheet for liquid crystal cells in IPS mode or FLC mode has a publication in JP,10-54982,A. Furthermore, the optical compensation sheet for liquid crystal cells in

OCB mode or HAN mode has a publication in each specification of a U.S. Pat. No. 5805253 number and international patent application WO 96/No. 37804. The optical compensation sheet for liquid crystal cells in STN mode has a publication in JP,9-26572,A further again. And the optical compensation sheet for liquid crystal cells in VA mode has a publication in the patent number No. 2866372 official report.

[0005]

[Problem(s) to be Solved by the Invention] It became possible to compensate a liquid crystal cell with replacing with the conventional extension birefringence polymer film, and using a discotheque liquid crystallinity molecule optically more correctly than before. For example, if the average tilt angle between the disk side of a discotheque liquid crystallinity molecule and a transporence base material side carries out orientation of the discotheque liquid crystallinity molecule in the less than 5-degree condition to a liquid crystal cell (VA mode, OCB mode, HAN mode) with many cylindrical liquid crystallinity molecules which are carrying out orientation perpendicularly substantially, it can compensate optically effectively. However, according to research of this invention person, even if it uses a discotheque liquid crystallinity molecule, it is very difficult [it] to compensate a liquid crystal cell optically completely satisfactory. The purpose of this invention is offering the optical compensation sheet with which a liquid crystal cell with many cylindrical liquid crystallinity molecules which are carrying out orientation perpendicularly substantially can be compensated optically correctly.

[0006]

[Means for Solving the Problem] the purpose of this invention -- the optical compensation sheet of following the (1) - (5), and the following -- it was attained by the liquid crystal display of (the elliptically-polarized-light plate of 6), and following (7).

(1) The optical compensation sheet with which it is the optical compensation sheet which has the optical anisotropy layer formed from the transporence base material and the discotheque liquid crystallinity molecule, a transporence base material has optical optically uniaxial or optical optically biaxial, and the average tilt angle between the disk side of a discotheque liquid crystallinity molecule and a transporence base material side is characterized by the discotheque liquid crystallinity molecule carrying out orientation in the less than 5-degree condition.

[0007] (2) An optical compensation sheet given in (1) in which a transporence base material has the retardation within a field (R_e) defined as 10 thru/or the range of 1000nm by the following formula. n_x and n_y are the refractive indexes within a field of a transporence base material among an $R_e = (n_x - n_y) \cdot d$ type, and d is the thickness of a transporence base material.

(3) An optical compensation sheet given in (1) in which a transporence base material has the retardation (R_{th}) of the thickness direction defined as 10 thru/or the range of 1000nm by the following formula. n_x and n_y are the refractive indexes within a field of a transporence base material among a $R_{th} = \{[(n_x + n_y) / 2] - n_z\} \cdot d$ type, and n_z is the refractive index of the thickness direction of a transporence base material, and d is the thickness of a transporence base material.

(4) An optical compensation sheet given in (1) in which an optical compensation sheet has the retardation within a field (R_e) defined as 20 thru/or the range of 200nm by the following formula. n_x and n_y are the refractive indexes within a field of an optical compensation sheet among an $R_e = (n_x - n_y) \cdot d$ type, and d is the thickness of an optical compensation sheet.

(5) An optical compensation sheet given in (1) in which an optical compensation sheet has the retardation (R_{th}) of the thickness direction defined as 70 thru/or the range of 500nm by the following formula.

n_x and n_y are the refractive indexes within a field of an optical compensation sheet among a $R_{th} = \{[(n_x + n_y) / 2] - n_z\} \cdot d$ type, and n_z is the refractive index of the thickness direction of an optical compensation sheet, and d is the thickness of an optical compensation sheet.

[0008] (6) The elliptically-polarized-light plate with which it is the elliptically-polarized-light plate which has the optical anisotropy layer, polarization film, and transporence protective coat which were formed from the transporence base material and the discotheque liquid crystallinity molecule, a transporence base material has optical optically uniaxial or optical optically biaxial, and the average tilt angle between the disk side of a discotheque liquid crystallinity molecule and a transporence base

material side is characterized by the discotheque liquid crystallinity molecule carrying out orientation in the less than 5-degree condition.

(7) It is the liquid crystal display which consists of a polarizing element of two sheets arranged at the liquid crystal cell in VA mode, and its both sides. The optical anisotropy layer in which at least one side of a polarizing element was formed from the transparence base material and the discotheque liquid crystallinity molecule, Are the elliptically-polarized-light plate which has the polarization film and a transparence protective coat, and a transparence base material has optical optically uniaxial or optical optically biaxial. And the liquid crystal display with which the average tilt angle between the disk side of a discotheque liquid crystallinity molecule and a transparence base material side is characterized by the discotheque liquid crystallinity molecule carrying out orientation in the less than 5-degree condition. [0009]

[Effect of the Invention] As for this invention person, the average tilt angle between the transparence base material which has optical optically uniaxial or optical optically biaxial, and the disk side of a discotheque liquid crystallinity molecule and a transparence base material side succeeded in a discotheque liquid crystallinity molecule compensating correctly optically a liquid crystal cell with many cylindrical liquid crystallinity molecules which are carrying out orientation perpendicularly substantially by using together the optical anisotropy layer which is carrying out orientation in the less than 5-degree condition as a result of research. It was going to compensate optically with the Prior art the liquid crystal cell with many cylindrical liquid crystallinity molecules which are carrying out orientation perpendicularly substantially only by the optical anisotropy of a discotheque liquid crystallinity molecule. Although there are various orientation gestalten in a discotheque liquid crystallinity molecule, there is a limit also in optical compensation of a liquid crystal cell only by the discotheque liquid crystallinity molecule. By this invention, it can respond to the optical property of a liquid crystal cell with many cylindrical liquid crystallinity molecules which are carrying out orientation perpendicularly substantially correctly by using the optical anisotropy of the transparence base material with which an average tilt angle has optical optically uniaxial or optical optically biaxial in the less than 5-degree condition in addition to the optical anisotropy of the discotheque liquid crystallinity molecule which is carrying out orientation (it compensates optically). Moreover, in addition to the liquid crystal cell, the polarization film also has the viewing-angle property. According to research of this invention person, use of the transparence base material which has optical optically uniaxial or optical optically biaxial (preferably optical optically biaxial) is effective in viewing-angle compensation of the polarization film. [0010]

[Embodiment of the Invention] Drawing 1 is the mimetic diagram showing the fundamental configuration of a transparency mold liquid crystal display. The transparency mold liquid crystal display shown in (a) of drawing 1 sequentially from a back light (BL) side A transparence protective coat (1a), the polarization film (2a), a transparence base material (3a), an optical anisotropy layer (4a), It consists of the bottom substrate of a liquid crystal cell (5a), a cylindrical liquid crystallinity molecule (6), the upper substrate (5b) of a liquid crystal cell, an optical anisotropy layer (4b), a transparence base material (3b), polarization film (2b), and a transparence protective coat (1b). A transparence base material and an optical anisotropy layer (3a-4a, and 4b-3b) constitute an optical compensation sheet. And a transparence protective coat, the polarization film, a transparence base material, and an optical anisotropy layer (1a-4a, and 4b-1b) constitute a elliptically-polarized-light plate. The transparency mold liquid crystal display shown in (b) of drawing 1 sequentially from a back light (BL) side It consists of a transparence protective coat (1a), the polarization film (2a), a transparence base material (3a), an optical anisotropy layer (4a), the bottom substrate of a liquid crystal cell (5a), a cylindrical liquid crystallinity molecule (6), the upper substrate (5b) of a liquid crystal cell, a transparence protective coat (1b), polarization film (2b), and a transparence protective coat (1c). A transparence base material and an optical anisotropy layer (3a-4a) constitute an optical compensation sheet. And a transparence protective coat, the polarization film, a transparence base material, and an optical anisotropy layer (1a-4a) constitute a elliptically-polarized-light plate.

[0011] The transparency mold liquid crystal display shown in (c) of drawing 1 sequentially from a back light (BL) side It consists of a transparence protective coat (1a), the polarization film (2a), a transparence protective coat (1b), the bottom substrate of a liquid crystal cell (5a), a cylindrical liquid crystallinity molecule (6), the upper substrate (5b) of a liquid crystal cell, an optical anisotropy layer (4b), a transparence base material (3b), polarization film (2b), and a transparence protective coat (1c). A transparence base material and an optical anisotropy layer (4b-3b) constitute an optical compensation sheet. And a transparence protective coat, the polarization film, a transparence base material, and an optical anisotropy layer (4b-1c) constitute a elliptically-polarized-light plate. Drawing 2 is the mimetic diagram showing the fundamental configuration of a reflective mold liquid crystal display. The reflective mold liquid crystal display shown in drawing 2 becomes order from the bottom substrate of a liquid crystal cell (5a), a reflecting plate (RP), a cylindrical liquid crystallinity molecule (6), the upper substrate (5b) of a liquid crystal cell, an optical anisotropy layer (4), a transparence base material (3), the polarization film (2), and a transparence protective coat (1) from the bottom. A transparence base material and an optical anisotropy layer (4-3) constitute an optical compensation sheet. And a transparence protective coat, the polarization film, a transparence base material, and an optical anisotropy layer (4-1) constitute a elliptically-polarized-light plate. In addition, in drawing 1 - drawing 2 , even if reverse in the sequence [base material / transparence / an optical anisotropy layer (4) and / (3)] of arrangement, it is good.

[0012] In [transparence base material] this invention, the transparence base material which has optical optically uniaxial or optical optically biaxial is used. It means that light transmittance is 80% or more as a base material is transparent. In the case of an optical optically uniaxial base material, it may be forward (it is size from the refractive index of the direction where the refractive index of the direction of an optical axis is perpendicular to an optical axis) optically, or you may be negative (it is smallness from the refractive index of the direction where the refractive index of the direction of an optical axis is perpendicular to an optical axis). In the case of an optical optically biaxial base material, the refractive indexes n_x , n_y , and n_z of a transparence base material become an altogether different value ($n_x \neq n_y \neq n_z$). It is desirable that they are 10 thru/or 1000nm, as for the retardation within a field of the transparence base material which has optical optically uniaxial or optical optically biaxial (R_e), it is still more desirable that they are 15 thru/or 300nm, and it is most desirable that they are 20 thru/or 200nm. It is desirable that they are 10 thru/or 1000nm, as for the retardation (R_{th}) of the thickness direction of the transparence base material which has optical optically uniaxial or optical optically biaxial, it is more desirable that they are 15 thru/or 300nm, and it is still more desirable that they are 20 thru/or 200nm. The retardation within a field of a transparence base material (R_e) and the retardation (R_{th}) of the thickness direction are defined by the following type, respectively.

n_x and n_y are the refractive indexes within a field of a transparence base material among an $R_e = (n_x - n_y) \cdot d$ type, and n_z is the refractive index of the thickness direction of a transparence base material, and d is the thickness of a transparence base material.

[0013] Generally as a transparence base material which has optical anisotropy, a synthetic polymer (an example, a polycarbonate, polysulfone, polyether sulphone, polyacrylate, polymethacrylate, norbornene resin) is used. However, the fall of whenever [use / of (1) retardation rise agent indicated by the Europe JP,0911656,B A No. 2 specification /, and acetylation / of (2) cellulose acetate] or manufacture of the film by (3) cooling solution process, The cellulose ester film which has optical anisotropy can also be manufactured. As for the transparence base material which consists of a polymer film, forming by the solvent cast method is desirable.

[0014] In order to obtain optical optically uniaxial or optical optically biaxial, it is desirable to carry out extension processing on a polymer film. What is necessary is just to carry out usual uniaxial-stretching processing or biaxial-stretching processing, when manufacturing an optical optically uniaxial base material. When manufacturing an optical optically biaxial base material, it is desirable to carry out imbalance biaxial-stretching processing. imbalance biaxial stretching -- a polymer film -- a certain direction -- fixed scale-factor (for example, 3 thru/or 100%, preferably 5 thru/or 30%) extension -- carrying out -- a direction perpendicular to it -- more than it -- scale-factor (for example, 6 thru/or 200%,

preferably 10 thru/or 90%) extension is carried out. Extension processing of two directions may be carried out to coincidence. As for the extension direction (direction where draw magnification is high in imbalance biaxial stretching), and the lagging axis within the field of the film after extension, it is desirable to become substantial in the same direction. It is desirable that it is less than 10 degrees, as for the include angle of the extension direction and a lagging axis, it is still more desirable that it is less than 5 degrees, and it is most desirable that it is less than 3 degrees.

[0015] The laminating of the transparence base material which has optical optically uniaxial or optical optically biaxial, and the transparence base material (an example, cellulose acetate film) which has the optical isotropy may be carried out. As for the thickness of a transparence base material, it is desirable that they are 10 thru/or 500 micrometers, and it is still more desirable that they are 50 thru/or 200 micrometers. In order to improve adhesion with a transparence base material and the layer (a glue line, the orientation film, or optical anisotropy layer) prepared on it, surface treatment (an example, glow discharge processing, corona discharge treatment, ultraviolet-rays (UV) processing, flame treatment) may be carried out to a transparence base material. An ultraviolet ray absorbent may be added to a transparence base material. A glue line (under coat) may be prepared on a transparence base material. About a glue line, JP,7-333433,A has a publication. As for the thickness of a glue line, it is desirable that they are 0.1 thru/or 2 micrometers, and it is still more desirable that they are 0.2 thru/or 1 micrometer.

[0016] The [orientation film] orientation film is a means like accumulation of the organic compound (an example, omega-tricosane acid, dioctadecyl methylanmmmonium chloride, stearyl acid methyl) by rubbing processing of an organic compound (preferably polymer), the method vacuum evaporatio of slanting of an inorganic compound, formation of the layer which has a micro groove, or the Langmuir-Blodgett's technique (LB film), and can be prepared. Furthermore, the orientation film which an orientation function produces is also known by grant of electric field, grant of a magnetic field, or optical exposure. Especially the orientation film formed by rubbing processing of a polymer is desirable. Rubbing processing is carried out by rubbing the front face of a polymer layer several times in the fixed direction with paper or cloth. In order for an average tilt angle to carry out orientation of the discotheque liquid crystallinity molecule in the less than 5-degree condition, it is desirable to use for the orientation film the polymer (the usual polymer for orientation film) to which surface energy of the orientation film is not reduced. As for the thickness of the orientation film, it is desirable that they are 0.01 thru/or 5 micrometers, and it is still more desirable that they are 0.05 thru/or 1 micrometer. In addition, since orientation of the discotheque liquid crystallinity molecule of an optical anisotropy layer is carried out using the orientation film, an optical anisotropy layer may be imprinted on a transparence base material. Even if the discotheque liquid crystallinity molecule fixed in the state of orientation does not have the orientation film, it can maintain an orientation condition. Moreover, in order for an average tilt angle to carry out orientation of the discotheque liquid crystallinity molecule in the less than 5-degree condition by this invention, it is not necessary to carry out rubbing processing, and the orientation film is also unnecessary depending on the case. However, a liquid crystallinity molecule and the orientation film (JP,9-152509,A publication) which forms a chemical bond may be used by the interface in order to improve the adhesion of a liquid crystallinity molecule and a transparence base material. When using the orientation film for the purpose of an adhesion improvement, it is not necessary to carry out rubbing processing.

[0017] A [optical anisotropy layer] optical anisotropy layer is formed from a discotheque liquid crystallinity molecule. The average tilt angle between the disk side of a discotheque liquid crystallinity molecule and a transparence base material side carries out orientation of the discotheque liquid crystallinity molecule in the less than 5-degree condition. As a result of having combined the transparence base material which has optically biaxial [which was mentioned above / optical optically uniaxial or optical optically biaxial], and the discotheque liquid crystallinity molecule in which the average tilt angle is carrying out orientation in the less than 5-degree condition, it is desirable that they are 20 thru/or 200nm, as for the retardation within a field of the whole optical compensation sheet (Re), it is still more desirable that they are 20 thru/or 100nm, and it is most desirable that they are 20 thru/or

70nm. It is desirable that they are 70 thru/or 500nm, as for the retardation (R_{th}) of the thickness direction of the whole optical compensation sheet, it is more desirable that it is 300m of 70 **, and it is still more desirable that they are 70 thru/or 200nm. The retardation within a field of an optical compensation sheet (R_e) and the retardation (R_{th}) of the thickness direction are defined by the following type, respectively.

n_x and n_y are the refractive indexes within a field of an optical compensation sheet among an $R_e = (n_x - n_y) \times d$ type, and n_z is the refractive index of the thickness direction of an optical compensation sheet, and d is the thickness of an optical compensation sheet.

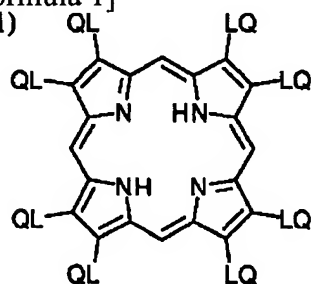
[0018] As for a discotheque liquid crystallinity molecule, being fixed in the condition of carrying out orientation is desirable. Although an orientation condition is also fixable using a polymer binder, fixing by the polymerization reaction is desirable. reference (C. -- the volume Destrade et al., Mol.Cryst.Liq.Cryst., vol.71, and for page 111 (1981); Chemical Society of Japan --) with various discotheque liquid crystallinity molecules Quarterly Chemistry Survey, No.22, the chemistry of liquid crystal, Chapter 5, The Chapter 10 second article (1994); B.Kohne et al. and Angew.Chem. It is indicated by Soc.Chem.Comm., page 1794;(1985) J.Zhang et al., J.Am.Chem.Soc., vol.116, and page 2655 (1994). About the polymerization of a discotheque liquid crystallinity molecule, a JP,8-27284,A official report has a publication. In order to fix a discotheque liquid crystallinity molecule by the polymerization, it is necessary to combine a polymerization nature machine with the disc-like core of a discotheque liquid crystallinity molecule as a substituent. However, if a polymerization nature machine is made to link with a disc-like core directly, it will become difficult to maintain an orientation condition in a polymerization reaction. Then, a connection radical is introduced between a disc-like core and a polymerization nature machine. Therefore, as for a discotheque liquid crystallinity molecule, it is desirable that it is the compound expressed with the following type (I).

[0019] (I) Among D(-L-Q) n type, D is a disc-like core,;L is the connection radical of bivalence,;Q is a polymerization nature machine, and; and n are the integers of 4 thru/or 12. The example of the disc-like core (D) of the above-mentioned formula is shown below. In each following example, LQ (or QL) means the combination of the connection radical (L) of bivalence, and a polymerization nature machine (Q).

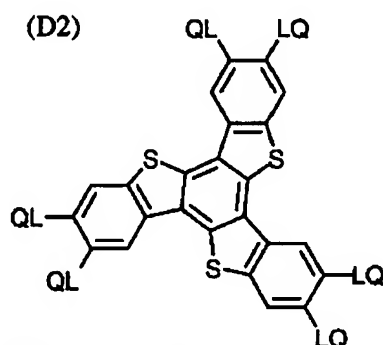
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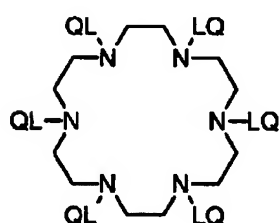
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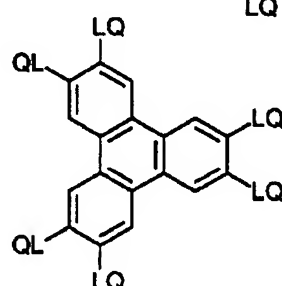
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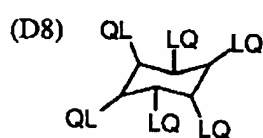
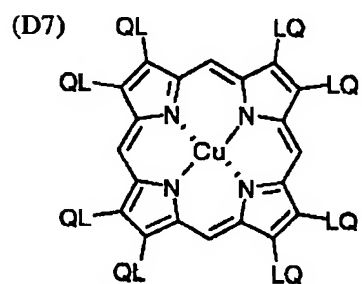
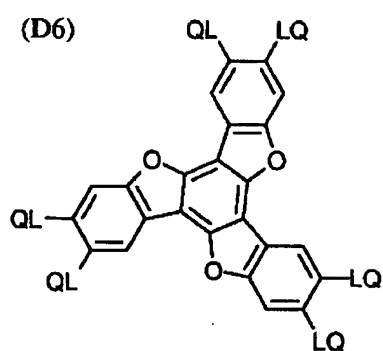
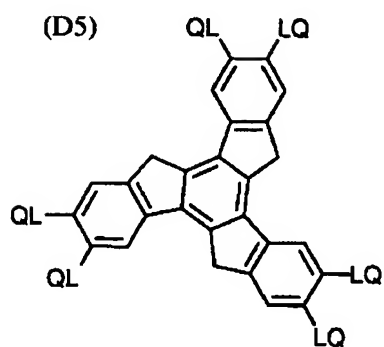


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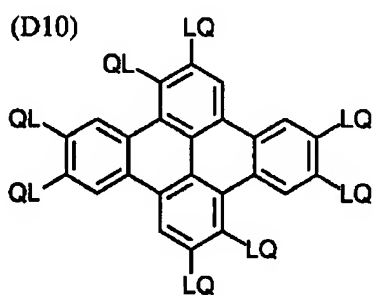
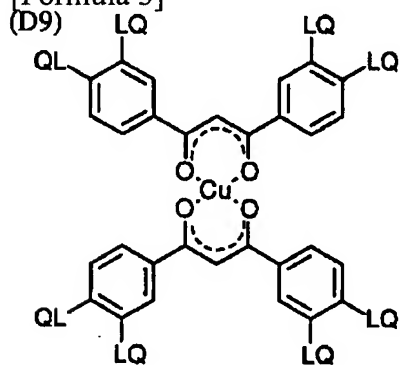
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[Formula 2]



[0022]

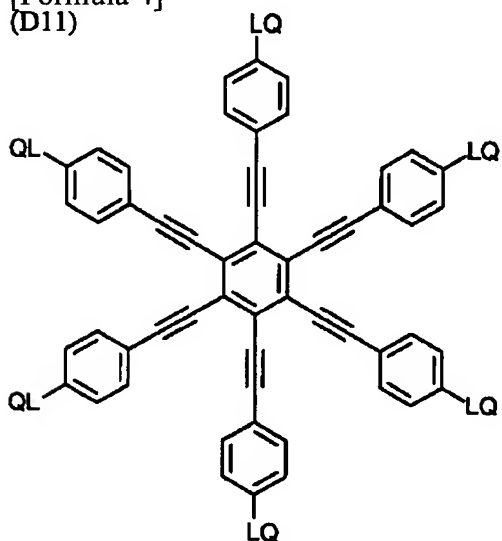
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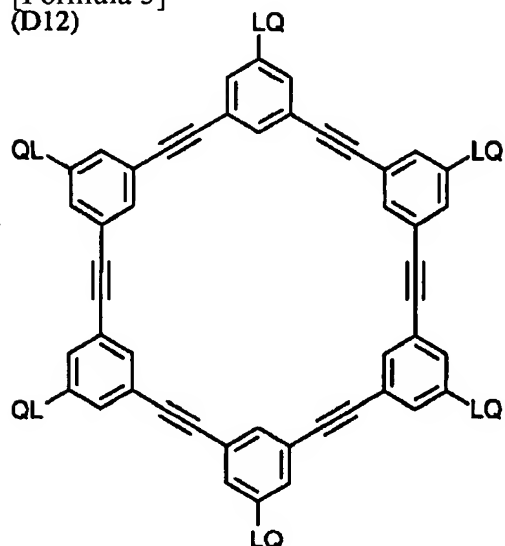
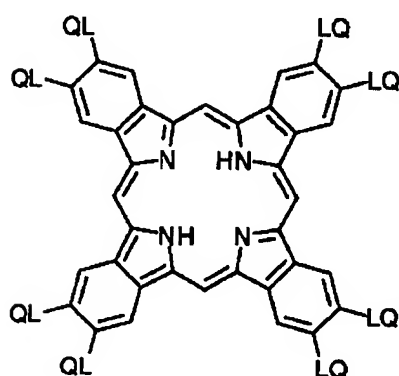
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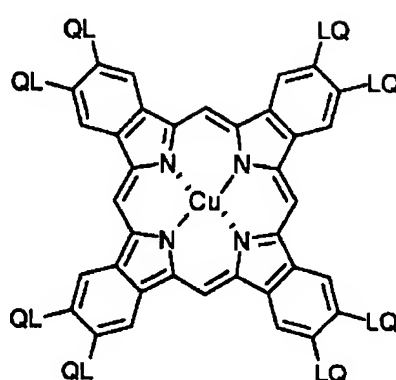
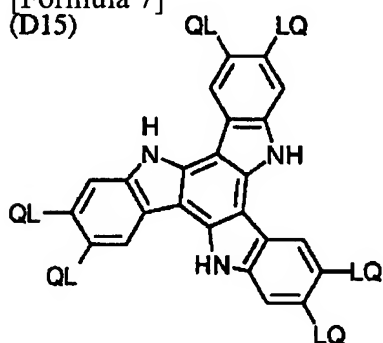
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[0024]

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(D12)[0025]
[Formula 6]
(D13)

(D14)

[0026]
[Formula 7]
(D15)

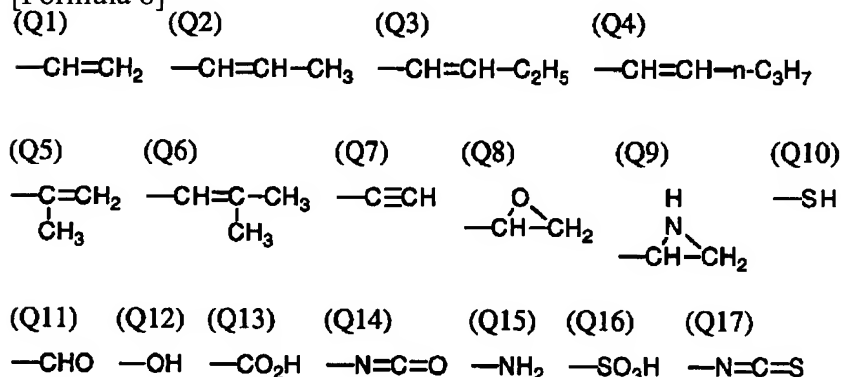
[0027] As for the connection radical (L) of bivalence, in the above-mentioned formula, it is desirable that it is the connection radical of the bivalence chosen from the group which consists of an alkylene group, an alkenylene group, an arylene radical, -CO-, -NH-, -O-, -S-, and those combination. As for the connection radical (L) of bivalence, it is still more desirable that it is the radical which combined at least two radicals of the bivalence chosen from the group which consists of an alkylene group, an alkenylene group, an arylene radical, -CO-, -NH-, -O-, and -S-. As for the connection radical (L) of bivalence, it is most desirable that it is the radical which combined at least two radicals of the bivalence chosen from

the group which consists of alkylene group, alkenylene group, arylene radical, and -CO- and -O-. As for the carbon atomic number of an alkylene group, it is desirable that it is 1 thru/or 12. As for the carbon atomic number of an alkenylene group, it is desirable that it is 2 thru/or 12. As for the carbon atomic number of an arylene radical, it is desirable that it is 6 thru/or 10. The alkylene group, the alkenylene group, and the arylene radical may have the substituent (an example, an alkyl group, a halogen atom, a cyano ** alkoxy group, acyloxy radical). The example of the connection radical (L) of bivalence is shown below. Left-hand side combines with a disc-like core (D), and right-hand side combines with a polymerization nature machine (Q). AL means an alkylene group or an alkenylene group, and AR means an arylene radical.

[0028] L1: -AL-CO-O-AL-L2: -AL-CO-O-AL-O-L3: -AL-CO-O-AL-O-AL-L4: -AL-CO-O-AL-O-CO-L5: -CO-AR-O-AL-L6: -CO-AR-O-AL-O-L7: -CO-AR-O-AL-O-CO-L8: -CO-NH-AL-L9: -NH-AL-O-L10: -NH-AL-O-CO-L11: -O-AL-L12: -O-AL-O-L13: -O-AL-O-CO-[0029] L14: -O-AL-O-CO-NH-AL-L15: -O-AL-S-AL-L16: -O-CO-AL-AR-O-AL-O-CO-L17: -O-CO-AR-O-AL-CO-L18: -O-CO-AR-O-AL-O-CO-L19: -O-CO-AR-O-AL-O-AL-O-CO-L20: -O-CO-AR-O-AL-O-AL-O-AL-O-CO-L21: -S-AL-L22: -S-AL-O-L23: -S-AL-O-CO-L24: -S-AL-S-AL-L25: -S-AR-AL-[0030] The polymerization nature machine (Q) of a formula (I) is determined according to the class of polymerization reaction. The example of a polymerization nature machine (Q) is shown below.

[0031]

[Formula 8]



[0032] It is desirable that they are a partial saturation polymerization nature machine (Q1-Q7), an epoxy group (Q8), or an aziridinyl radical (Q9), as for a polymerization nature machine (Q), it is still more desirable that it is a partial saturation polymerization nature machine, and it is most desirable that it is an ethylene nature partial saturation polymerization nature machine (Q1-Q6). In a formula (I), n is the integer of 4 thru/or 12. A concrete figure is determined according to the class of discotheque core (D). In addition, although the combination of two or more L and Q may differ, its same thing is desirable.

[0033] Two or more kinds of discotheque liquid crystallinity molecules may be used together. For example, a polymerization nature discotheque liquid crystallinity molecule and a non-polymerization nature discotheque liquid crystallinity molecule which were described above can be used together. As for a non-polymerization nature discotheque liquid crystallinity molecule, it is desirable that it is the compound which changed into the hydrogen atom or the alkyl group the polymerization nature machine (Q) of the polymerization nature discotheque liquid crystallinity molecule mentioned above. That is, as for a non-polymerization nature discotheque liquid crystallinity molecule, it is desirable that it is the compound expressed with the following type (Ia).

(Ia) Among D(-L-R) n type, D is a disc-like core,;L is the connection radical of bivalence,;R is a hydrogen atom or an alkyl group, and; and n are the integers of 4 thru/or 12. The example of the disc-like core (D) of a formula (Ia) is the same as the example of the aforementioned polymerization nature discotheque liquid crystal molecule except changing LQ (or QL) into LR (or RL). Moreover, the example of the connection radical (L) of bivalence is the same as the example of the aforementioned polymerization nature discotheque liquid crystal molecule. As for the alkyl group of R, it is desirable

that carbon atomic numbers are 1 thru/or 40, and it is still more desirable that it is 1 thru/or 30. The chain-like alkyl group is more desirable than an annular alkyl group, and the straight chain-like alkyl group is more desirable than the chain-like alkyl group which has branching. As for R, it is desirable that a hydrogen atom or a carbon atomic number is especially the straight chain-like alkyl group of 1 thru/or 30.

[0034] In order for the average tilt angle of the disk side of a discotheque liquid crystallinity molecule and a transperance base material side to carry out orientation of the discotheque liquid crystallinity molecule in the less than 5-degree condition, it is desirable to use a discotheque liquid crystallinity molecule and the compound which can carry out phase separation in the amount of the fixed range. The compound which has the lower-fatty-acid ester, fluorine-containing surface active agent, and 1,3,5-triazine ring of a cellulose is contained in a discotheque liquid crystallinity molecule and the compound which can carry out phase separation.

[0035] As for the "lower fatty acid" in the lower-fatty-acid ester of a cellulose, a carbon atomic number means six or less fatty acid. As for a carbon atomic number, it is desirable that it is 2 thru/or 5, and it is still more desirable that it is 2 thru/or 4. The substituent (an example, hydroxy) may combine with the fatty acid. Two or more kinds of fatty acids may form a cellulose and ester. Cellulose acetate, cellulose propionate, cellulose butyrate, cellulose hydroxy propionate, cellulose acetate propionate, and cellulose acetate butylate are contained in the example of the lower-fatty-acid ester of a cellulose. Especially cellulose acetate butylate is desirable. As for whenever [butyryl-ized / of cellulose acetate butylate], it is desirable that it is 30% or more, and it is still more desirable that they are 30 thru/or 80%. As for whenever [acetylation / of cellulose acetate butylate], it is desirable that it is 30% or less, and it is still more desirable that they are 1 thru/or 30%. It is desirable to use it in 0.01 thru/or 1% of the weight of the amount of the amount of a discotheque liquid crystallinity molecule, as for the lower-fatty-acid ester of a cellulose, it is still more desirable to use it in 0.1 thru/or 1% of the weight of an amount, and it is most desirable to use it in 0.3 thru/or 0.9% of the weight of an amount. The coverage of the lower-fatty-acid ester of a cellulose is 1 thru/or 500 mg/m². It is desirable that it is the range and they are 3 thru/or 300 mg/m². It is still more desirable that it is the range and they are 5 thru/or 200 mg/m². It is most desirable that it is the range.

[0036] A fluorine-containing surface active agent consists of a connection radical prepared in the hydrophilic radical and arbitration of the hydrophobic radical containing a fluorine atom, nonionicity, anionic, cationicity, or both sexes. The fluorine-containing surfactant which consists of one hydrophobic radical and one hydrophilic radical is expressed with the following formula (II).

[0037] (II) The inside of a R_f-L₃-Hy type and R_f are the hydrocarbon residue of the monovalence permuted by the fluorine atom, and are; L₃. It is single bond or the connection radical of bivalence, and; and Hy are hydrophilic radicals. R_f of a formula (II) functions as a hydrophobic radical. As for hydrocarbon residue, it is desirable that they are an alkyl group or an aryl group. As for the carbon atomic number of an alkyl group, it is desirable that it is 3 thru/or 30, and, as for the carbon atomic number of an aryl group, it is desirable that it is 6 thru/or 30. A part or all of a hydrogen atom that is contained in hydrocarbon residue is permuted by the fluorine atom. It is more desirable to permute 60% or more, it is desirable to permute 50% or more of the hydrogen atom contained in hydrocarbon residue by the fluorine atom, and it is [it is still more desirable to permute 70% or more, and] most desirable to permute 80% or more. The remaining hydrogen atoms may be permuted by the halogen atom (an example, a chlorine atom, bromine atom) of further others. The example of R_f is shown below.

[0038] R_{f1}:n-C₈ F₁₇-R_{f2}:n-C₆ F₁₃-R_{f3}:Cl-(CF₂-CFCI) 3 - CF₂-R_f 4:H-(CF₂) 8 - R_{f5}:H-(CF₂)10- R_{f6}:n-C₉ F₁₉-R_{f7} : Pentafluorophenyl R_{f8}:n-C₇ F₁₅-R_{f9}:Cl-(CF₂-CFCI)2-CF₂-R_{f10}:H-(CF₂)4- R_{f11}:H-(CF₂)6-R_{f12}:Cl-(CF₂)6-R_{f13}:C₃ F₇-[0039] As for the connection radical of bivalence, in a

formula (II), it is desirable that it is the connection radical of the bivalence chosen from the group which consists of an alkylene group, an arylene radical, the heterocycle residue of bivalence, -CO-, -NR- (a carbon atomic number is the alkyl group or hydrogen atom of 1 thru/or 5 for R), -O-, -SO₂-, and those combination. L₃ of a formula (II) An example is shown below. Left-hand side combines with a hydrophobic radical (R_f), and right-hand side combines with a hydrophilic radical (Hy). In AL, an

alkylene group and AR mean an arylene radical and Hc means the heterocycle residue of bivalence. In addition, an alkylene group, an arylene radical, and the heterocycle residue of bivalence may have the substituent (an example, alkyl group).

[0040] L0 : Single bond L31:-SO₂-NR-L32:-AL-O-L33:-CO-NR-L34:-AR-O-L35:-SO₂-NR-AL-CO-O-L36:-CO-O-L37:-SO₂-NR-AL-O-L38:-SO₂ - NR-AL-L39:-CO-NR-AL-L40:-AL₁-O-AL₂-L41:-Hc-AL-L42:-SO₂-NR-AL₁-O-AL₂-L43:-AR-L44:-O-AR-SO₂-NR-AL-L45:-O-AR-SO₂ - NR-L46:-O-AR-O-[0041] H(ies) of a formula (II) are either a nonionic hydrophilic radical, an anionic hydrophilic radical, cationic hydrophilic radicals or those combination (both-sexes hydrophilic radical). Especially a nonionic hydrophilic radical is desirable. The example of Hy of a formula (II) is shown below.

[0042] Hy1: -(CH₂ CH₂ O) n-H (n is the integer of 5 thru/or 30)

Hy2: -(CH₂ CH₂ O) n-R₁ (for the integer of 5 thru/or 30, and R₁, a carbon atomic number is [n] the alkyl group of 1 thru/or 6)

Hy3: -(CH₂ CHOHCH₂) n-H (n is the integer of 5 thru/or 30)

Hy4: -COOM (M is a hydrogen atom, an alkali-metal atom, or a dissociation condition)

Hy5: -SO₃ M (M is a hydrogen atom, an alkali-metal atom, or a dissociation condition)

Hy6: -(CH₂ CH₂ O) n-CH₂ CH₂ CH₂-SO₃ M (n is the integer of 5 thru/or 30 and M is a hydrogen atom or an alkali-metal atom)

Hy7: -OPO(OH)2Hy8:-N+3 (CH₃) and X - (X is a halogen atom)

Hy9: -COONH₄ [0043] A nonionic hydrophilic radical (Hy1, Hy2, Hy3) is desirable, and the hydrophilic radical (Hy1) which consists of polyethylene oxide is the most desirable. It is the example of a fluorine-containing surfactant expressed with a formula (II) The above R_f and L₃ And the example of Hy is quoted and shown.

[0044] FS-1:Rf1-L31(R=C₃ H₇)-Hy1(n=6)

FS-2:Rf1-L31(R=C₃ H₇)-Hy1(n=11)

FS-3:Rf1-L31(R=C₃ H₇)-Hy1(n=16)

FS-4:Rf1-L31(R=C₃ H₇)-Hy1(n=21)

FS-5:Rf1-L31(R=C₂ H₅)-Hy1(n=6)

FS-6:Rf1-L31(R=C₂ H₅)-Hy1(n=11)

FS-7:Rf1-L31(R=C₂ H₅)-Hy1(n=16)

FS-8:Rf1-L31(R=C₂ H₇)-Hy1(n=21)

FS-9:Rf2-L31(R=C₃ H₇)-Hy1(n=6)

FS-10:Rf2-L31(R=C₃ H₇)-Hy1(n=11)

FS-11:Rf2-L31(R=C₃ H₇)-Hy1(n=16)

FS-12:Rf2-L31(R=C₃ H₇)-Hy1(n=21)

FS-13:Rf3-L32(AL=CH₂)-Hy1(n=5)

FS-14:Rf3-L32(AL=CH₂)-Hy1(n=10)

FS-15:Rf3-L32(AL=CH₂)-Hy1(n=15)

FS-16:Rf3-L32(AL=CH₂)-Hy1(n=20)

FS-17:Rf4-L33(R=C₃ H₇)-Hy1(n=7)

FS-18:Rf4-L33(R=C₃ H₇)-Hy1(n=13)

FS-19:Rf4-L33(R=C₃ H₇)-Hy1(n=19)

FS-20:Rf4-L33(R=C₃ H₇)-Hy1(n=25)

[0045] FS-21:Rf5-L32(AL=CH₂)-Hy1(n=11)

FS-22:Rf5-L32(AL=CH₂)-Hy1(n=15)

FS-23:Rf5-L32(AL=CH₂)-Hy1(n=20)

FS-24:Rf5-L32(AL=CH₂)-Hy1(n=30)

FS-25: Rf6-L34(AR=p-phenylene)-Hy1 (n= 11)

FS-26: Rf6-L34(AR=p-phenylene)-Hy1 (n= 17)

FS-27: Rf6-L34(AR=p-phenylene)-Hy1 (n= 23)

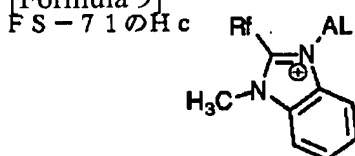
FS-28: Rf6-L34(AR=p-phenylene)-Hy1 (n= 29)

FS-29: Rf1-L35(R=C three H₇ and AL=CH₂)-Hy1 (n= 20)

FS-30: Rf1-L35(R=C three H7 and AL=CH₂)-Hy1 (n= 30)
 FS-31: Rf1-L35(R=C three H7 and AL=CH₂)-Hy1 (n= 40)
 FS-32: Rf1-L36-Hy1(n=5)
 FS-33: Rf1-L36-Hy1(n=10)
 FS-34: Rf1-L36-Hy1(n=15)
 FS-35: Rf1-L36-Hy1(n=20)
 FS-36: Rf7-L36-Hy1(n=8)
 FS-37: Rf7-L36-Hy1(n=13)
 FS-38: Rf7-L36-Hy1(n=18)
 FS-39: Rf7-L36-Hy1(n=25)
 [0046] FS-40: Rf1-L0-Hy1(n=6)
 FS-41: Rf1-L0-Hy1(n=11)
 FS-42: Rf1-L0-Hy1(n=16)
 FS-43: Rf1-L0-Hy1(n=21)
 FS-44: Rf1-L31(R=C three H7)-Hy2 (n= 7 and R1 =C two H5)
 FS-45: Rf1-L31(R=C three H7)-Hy2 (n= 13 and R1 =C two H5)
 FS-46: Rf1-L31(R=C three H7)-Hy2 (n= 20 and R1 =C two H5)
 FS-47: Rf1-L31(R=C three H7)-Hy2 (n= 28 and R1 =C two H5)
 FS-48: Rf8-L32(AL=CH₂)-Hy1(n=5)
 FS-49: Rf8-L32(AL=CH₂)-Hy1(n=10)
 FS-50: Rf8-L32(AL=CH₂)-Hy1(n=15)
 FS-51: Rf8-L32(AL=CH₂)-Hy1(n=20)
 FS-52: Rf1-L37(R=C three H7, AL=CH₂CH₂)-Hy3 (n= 5)
 FS-53: Rf1-L37(R=C three H7, AL=CH₂CH₂)-Hy3 (n= 7)
 FS-54: Rf1-L37(R=C three H7, AL=CH₂CH₂)-Hy3 (n= 9)
 FS-55: Rf1-L37(R=C three H7, AL=CH₂CH₂)-Hy3 (n= 12)
 FS-56: Rf9-L0-Hy4(M=H)
 FS-57: Rf3-L0-Hy4(M=H)
 FS-58: Rf1-L38(R=C three H7 and AL=CH₂)-Hy4 (M=K)
 FS-59: Rf4-L39(R=C three H7 and AL=CH₂)-Hy4 (M=Na)
 [0047] FS-60: Rf1-L0-Hy5(M=K)
 FS-61: Rf10-L40(AL1 =CH₂, AL2 =CH₂CH₂)-Hy5 (M=Na)
 FS-62: Rf11-L40(AL1 =CH₂, AL2 =CH₂CH₂)-Hy5 (M=Na)
 FS-63: Rf5-L40(AL1 =CH₂, AL2 =CH₂CH₂)-Hy5 (M=Na)
 FS-64: Rf1-L38(R=C3H7 and AL=CH₂CH₂CH₂)-Hy5(M=Na) FS-65: Rf1-L31(R=C three H7)-Hy6 (n= 5, M=Na)
 FS-66: Rf1-L31(R=C three H7)-Hy6 (n= 10, M=Na)
 FS-67: Rf1-L31(R=C three H7)-Hy6 (n= 15, M=Na)
 FS-68: Rf1-L31(R=C three H7)-Hy6 (n= 20, M=Na)
 FS-69: Rf1-L38(R=C two H5 and AL=CH₂CH₂)-Hy7
 FS-70: Rf1-L38(R=H and AL=CH₂CH₂CH₂)-Hy8 (X=I)
 FS-71: Rf11-L41(following Hc and AL=CH₂CH₂CH₂)-Hy6 (M dissociates)

[0048]

[Formula 9]



[0049] FS-72: Rf1-L42(R=C3H7, AL1=CH₂CH₂, AL2=CH₂CH₂CH₂)-Hy6(M=Na) FS-73: Rf12-L0-

Hy5 (M=Na)

FS-74: Rf13-L43(AR=o-phenylene)-Hy6 (M=K)

FS-75: Rf13-L43(AR=m-phenylene)-Hy6 (M=K)

FS-76: Rf13-L43(AR=p-phenylene)-Hy6 (M=K)

FS-77: Rf6-L44(R=C₂H₅, AL=CH₂CH₂)-Hy5 (M=H)

FS-78: Rf6-L45(AR=p-phenylene, R=C₂H₅)-Hy1 (n= 9)

FS-79: Rf6-L45(AR=p-phenylene, R=C₂H₅)-Hy1 (n= 14)

FS-80: Rf6-L45(AR=p-phenylene, R=C₂H₅)-Hy1 (n= 19)

FS-81: Rf6-L45(AR=p-phenylene, R=C₂H₅)-Hy1 (n= 28)

FS-82: Rf6-L46(AR=p-phenylene)-Hy1 (n= 5)

FS-83: Rf6-L46(AR=p-phenylene)-Hy1 (n= 10)

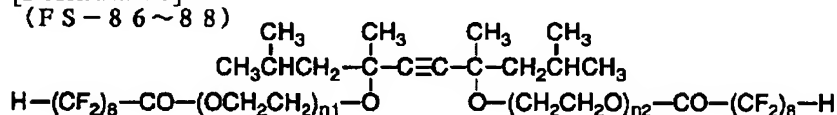
FS-84: Rf6-L46(AR=p-phenylene)-Hy1 (n= 15)

FS-85: Rf6-L46(AR=p-phenylene)-Hy1 (n= 20)

[0050] The fluorine-containing surfactant which has the hydrophobic radical or hydrophilic radical containing a fluorine atom two or more may be used. The example of the fluorine-containing surfactant which has two or more hydrophobic radicals or a hydrophilic radical is shown below.

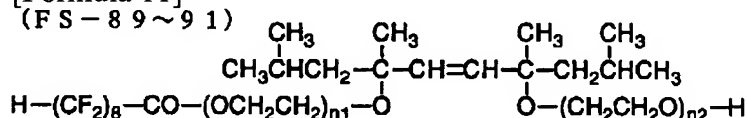
[0051]

[Formula 10]



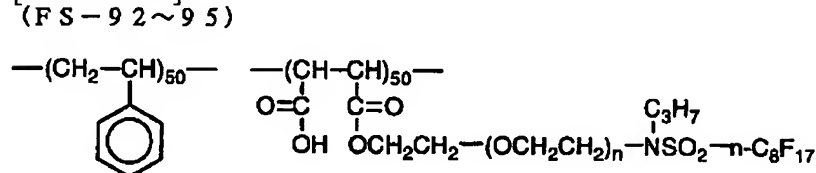
[0052] FS-86: n₁+n₂=12, FS-87:n₁+n₂=18, FS-88:n₁+n₂=24[0053]

[Formula 11]



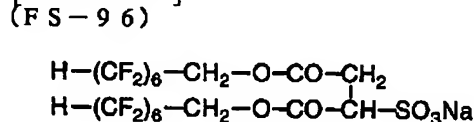
[0054] FS-89: n₁+n₂=20, FS-90:n₁+n₂=30, FS-91:n₁+n₂=40[0055]

[Formula 12]



[0056] FS-92: n=5, FS-93:n=10, FS-94:n=15, FS-95:n=20[0057]

[Formula 13]

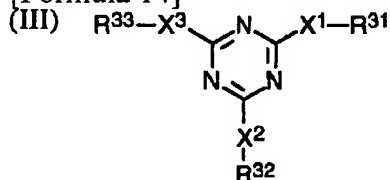


[0058] Two or more kinds of fluorine-containing surfactants may be used together. About a surfactant, various reference (an example, Horiguchi **** "Neogaea side activator" Sankyo Publishing (1975), M.J.Schick, Nonionic Surfactants, Marcell Dekker Inc., New York (1967), JP,7-13293,A) has a publication. It is desirable to use it in 2 thru/or 30% of the weight of the amount of the amount of a disothèque liquid crystallinity molecule, as for a fluorine-containing surface active agent, it is still more desirable to use it in 3 thru/or 25% of the weight of an amount, and its ***** used in 5 thru/or 10% of the weight of an amount is also desirable. The coverage of a fluorine-containing surfactant is 25 thru/or 1000 mg/m². It is desirable that it is the range and they are 30 thru/or 500 mg/m². It is still more

desirable that it is the range and they are 35 thru/or 200 mg/m². It is most desirable that it is the range. [0059] As for the compound which has a 1,3,5-triazine ring, it is desirable that it is the compound expressed with the following type (III).

[0060]

[Formula 14]



[0061] The inside of a formula, X1, and X2 And X3 It is single bond, -NR- (for R, a carbon atomic number is the alkyl group or hydrogen atom of 1 thru/or 30), -O-, or -S-, and, and R31, R32 and R33 are an alkyl group, an alkenyl radical, an aryl group, or a heterocycle radical independently, respectively. As for the compound expressed with a formula (III), it is desirable that it is especially a melamine compound. With a melamine compound, it sets at a ceremony (III), and is X1 and X2. Or X3 It is -NR- or is X1 and X2. Or X3 It is single bond and is the heterocycle radical to which R31, R32, and R33 have a residual valence in a nitrogen atom. A formula (IV) is quoted and a melamine compound is further explained to a detail. - As for R of NR-, it is desirable that it is especially a hydrogen atom. As for R31, R32, and R33, it is desirable that it is especially an aryl group.

[0062] It is more desirable for the above-mentioned alkyl group to be a chain-like alkyl group from an annular alkyl group. The straight chain-like alkyl group is more desirable than the chain-like alkyl group which has branching. It is more desirable that it is 2 thru/or 30, it is desirable that it is 1 thru/or 30, and it is [as for the carbon atomic number of an alkyl group, it is still more desirable that it is 4 thru/or 30, and] most desirable that it is 6 thru/or 30. The alkyl group may have the substituent. A halogen atom, an alkoxy group (example, methoxy, and ethoxy ** epoxy ethyloxy), and an acyloxy radical (an example, acryloyloxy, methacryloyloxy) are contained in the example of a substituent. It is more desirable for the above-mentioned alkenyl radical to be a chain-like alkenyl radical from an annular alkenyl radical. The straight chain-like alkenyl radical is more desirable than the chain-like alkenyl radical which has branching. It is more desirable that it is 3 thru/or 30, it is desirable that it is 2 thru/or 30, and it is [as for the carbon atomic number of an alkenyl radical, it is still more desirable that it is 4 thru/or 30, and] most desirable that it is 6 thru/or 30. The alkenyl radical may have the substituent. A halogen atom, an alkoxy group (example, methoxy, and ethoxy ** epoxy ethyloxy), and an acyloxy radical (an example, acryloyloxy, methacryloyloxy) are contained in the example of a substituent.

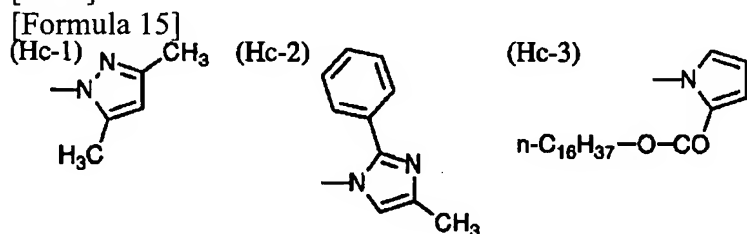
[0063] As for the above-mentioned aryl group, it is desirable that they are phenyl or naphthyl, and it is desirable that it is especially phenyl. The aryl group may have the substituent. For the example of a substituent, a halogen atom, the hydroxyl, cyano ** nitrolycerine, carboxyl, An alkyl group, an alkenyl radical, an aryl group, an alkoxy group, an alkenyloxy radical, An aryloxy group, an acyloxy radical, an alkoxy carbonyl group, an alkenyloxy carbonyl group, An aryloxy carbonyl group, sulfamoyl, an alkylation sulfamoyl group, An alkenyl permutation sulfamoyl group, an aryl permutation sulfamoyl group, A sulfonamide radical, carbamoyl, an alkylation carbamoyl group, an alkenyl permutation carbamoyl group, an aryl permutation carbamoyl group, an amide group, an alkylthio group, an alkenyl thio radical, an arylthio radical, and an acyl group are contained. The above-mentioned alkyl group has the same definition as the alkyl group mentioned above. It is the same as that of an alkoxy group, an acyloxy radical, an alkoxy carbonyl group, an alkylation sulfamoyl group, a sulfonamide radical, an alkylation carbamoyl group, an amide group, an alkylthio group, and the alkyl group that also mentioned the alkyl part of an acyl group above. The above-mentioned alkenyl radical has the same definition as the alkenyl radical mentioned above. It is the same as that of the alkenyl radical which also mentioned above the alkenyl parts of an alkenyloxy radical, an acyloxy radical, an alkenyloxy carbonyl group, an alkenyl permutation sulfamoyl group, a sulfonamide radical, an alkenyl permutation carbamoyl group, an amide group, an alkenyl thio radical, and an acyl group. Phenyl, alpha-naphthyl, beta-naphthyl, 4-

methoxyphenyl, 3, 4-diethoxy phenyl, 4-octyloxy phenyl, and 4-dodecyloxy phenyl are contained in the example of the above-mentioned aryl group. The example of the parts of an aryloxy group, an acyloxy radical, an aryloxy carbonyl group, an aryl permutation sulfamoyl group, a sulfonamide radical, an aryl permutation carbamoyl group, an amide group, an arylthio radical, and an acyl group is the same as the example of the above-mentioned aryl group.

[0064] X1 X2 Or X3 As for the heterocycle radical in the case of being -NR-, -O-, or -S-, it is desirable to have aromaticity. Generally the heterocycle which has aromaticity is partial saturation heterocycle, and is heterocycle which has the most desirable double bonds. It is desirable that they are a five-membered ring, six membered-rings, or seven membered-rings, as for heterocycle, it is still more desirable that they are a five-membered ring or six membered-rings, and it is most desirable that they are six membered-rings. As for the hetero atom of heterocycle, it is desirable that they are N, S, or O, and it is desirable that it is especially N. Especially as heterocycle which has aromaticity, a pyridine ring (as a heterocycle radical, they are 2-pyridyl or 4-pyridyl) is desirable. The heterocycle radical may have the substituent. The example of the substituent of a heterocycle radical is the same as the example of the substituent of the above-mentioned aryl part. X1 X2 Or X3 As for the heterocycle radical in the case of being single bond, it is desirable that it is the heterocycle radical which has a residual valence in a nitrogen atom. It is desirable that they are a five-membered ring, six membered-rings, or seven membered-rings, as for the heterocycle radical which has a residual valence in a nitrogen atom, it is still more desirable that they are a five-membered ring or six membered-rings, and it is most desirable that it is a five-membered ring. The heterocycle radical may have two or more nitrogen atoms. Moreover, the heterocycle radical may have hetero atoms other than a nitrogen atom (an example, O, S). The heterocycle radical may have the substituent. The example of the substituent of a heterocycle radical is the same as the example of the substituent of the above-mentioned aryl part. Below, the example of a heterocycle radical with a residual valence is shown in a nitrogen atom.

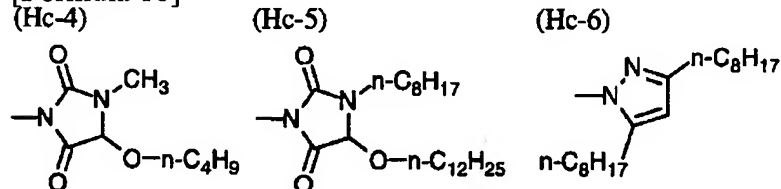
[0065]

[Formula 15]



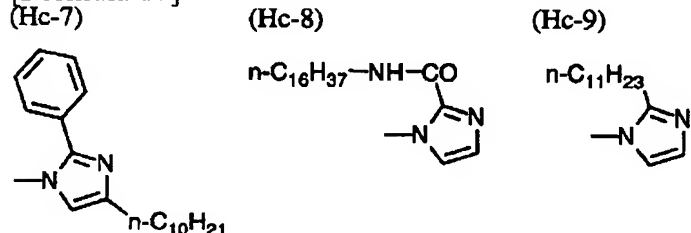
[0066]

[Formula 16]



[0067]

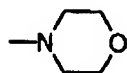
[Formula 17]



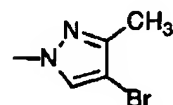
[0068]

[Formula 18]

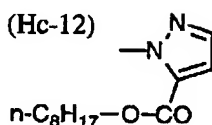
(Hc-10)



(Hc-11)



(Hc-12)



[0069] As for at least one of R31, R32, and the R33, it is desirable that a carbon atomic number contains the alkylene parts or alkenylene parts of 9 thru/30. As for the alkylene parts or alkenylene parts of 9 thru/30, it is desirable that a carbon atomic number is a straight chain-like. As for an alkylene part or an alkenylene part, being contained in the substituent of an aryl group is desirable. Moreover, as for at least one of R31, R32, and the R33, it is desirable to have a polymerization nature machine as a substituent. As for the compound which has a 1,3,5-triazine ring, it is desirable to have at least two polymerization nature machines. Moreover, as for a polymerization nature machine, it is desirable to be located in the end of R31, R32, or R33. It can be made to contain in an optical anisotropy layer in the condition that the compound and disothèque liquid crystallinity molecule which have a 1,3,5-triazine ring are carrying out the polymerization by introducing a polymerization nature machine into the compound which has a 1,3,5-triazine ring. The following type (Rp) shows R31, R32, or R33 which have a polymerization nature machine as a substituent.

[0070] (Rp) The inside of a -L5 n (-Q) type, and L5 It is the connection radical of ** (n+1),;Q is a polymerization nature machine, and; and n are the integers of 1 thru/5. As for the connection radical (L5) of ** (n+1), in a formula (RpI), it is desirable that it is the connection radical which combined at least two radicals chosen from the group which consists of an alkylene group, an alkenylene group, an n+ univalent aromatic series radical, the heterocycle residue of bivalence, -CO-, -NR- (a carbon atomic number is the alkyl group or hydrogen atom of 1 thru/30 for R), -O-, -S-, and -SO2-. As for the carbon atomic number of an alkylene group, it is desirable that it is 1 thru/12. As for the carbon atomic number of an alkenylene group, it is desirable that it is 2 thru/12. As for the carbon atomic number of an aromatic series radical, it is desirable that it is 6 thru/10. L5 of a formula (Rp) An example is shown below. Left-hand side is X1 of a formula (III), and X2. Or it combines with X3 (when X1, X2, or X3 is single bond, it links with a 1,3,5-triazine ring directly), and right-hand side combines with a polymerization nature machine (L53-L59 n pieces) (Q). In AL, an alkylene group or an alkenylene group, and Hc mean the heterocycle residue of bivalence, and AR means an aromatic series radical. In addition, an alkylene group, an alkenylene group, heterocycle residue, and an aromatic series radical may have the substituent (an example, an alkyl group, halogen atom).

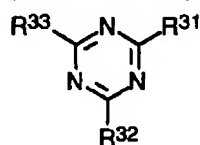
[0071] L51:-AL-O-CO-L52:-AL-O-L53:-AR(-O-AL-O-CO-) nL54:-AR(-O-AL-O-) nL55:-AR(-O-CO-AL-O-CO-) nL56:-AR(-CO-O-AL-O-CO-) nL57:-AR (-O-CO-AR-O-AL-O-CO-) nL58:-AR(-NR-SO2-AL-O-CO-) nL59:-AR(-SO2-NR-AL-O-CO-) n [0072] The example of the polymerization nature machine (Q) in a formula (Rp) is the same as the example (Q1-Q17) of the polymerization nature machine of a disothèque liquid crystallinity molecule. A polymerization nature machine is used in order to carry out the polymerization of the compound and disothèque liquid crystallinity molecule which have a 1,3,5-triazine ring. Therefore, it is desirable that the polymerization nature machine of a compound and the polymerization nature machine of a disothèque liquid crystallinity molecule which have a 1,3,5-triazine ring are a similar functional group. Therefore, it is desirable that they are a partial saturation polymerization nature machine (Q1-Q7), an epoxy group (Q8), or an aziridinyl radical (Q9), as for the polymerization nature machine of a disothèque liquid crystallinity molecule, and the polymerization nature machine (Q) of the compound which has a 1,3,5-triazine ring similarly, it is still more desirable that it is a partial saturation polymerization nature machine, and it is most desirable that it is an ethylene nature partial saturation polymerization nature machine (Q1-Q6). When n is plurality (2 thru/5), as for a connection radical (L5), it is desirable to branch in an aromatic series radical including an n+ univalent aromatic series radical. As for n, it is desirable that it is the integer of 1 thru/3.

[0073] The example (except for a melamine compound) of a compound of having a 1,3,5-triazine ring is shown below.

[0074]

[Formula 19]

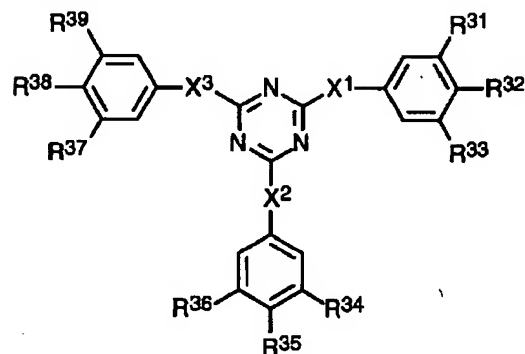
(TR-1 ~ 13)



[0075] TR-1:R³¹, R³², R³³:- (CH₂)₉-O-CO-CH=CH₂TR-2:R³¹, R³², R³³:- (CH₂)₄-CH=CH-(CH₂)₄-O-CO-CH=CH₂TR-3:R³¹, and R³²:- (CH₂)₉-O-CO-CH=CH₂; R³³:- 12-CH₃TR-4:R³¹, R³²:- (CH₂)₄-CH=CH-(CH₂)₄-O-CO-CH=CH₂;R³³:- (CH₂)₁₂-CH₃TR-5:R³¹:- (CH₂)₉-O-CO-CH=CH₂;R³², R³³:- (CH₂)₁₂-CH₃TR-6:R³¹:- (CH₂)₄-CH=CH-(CH₂)₄-O-CO-CH=CH₂;R³², R³³:- (CH₂)₁₂-CH₃TR-7:R³¹, and R³²:- (CH₂)₄-O-CO-CH=CH₂ (CH₂); R³³:- 12-CH₃TR-8:R³¹:- (CH₂)₄-O-CO-CH=CH₂ (CH₂); R³², R³³:- 12-CH₃TR-9:R³¹, R³², R³³:- (CH₂)₉-O-EpEtTR-10: (CH₂) R³¹, R³², R³³:- 4-CH=CH-(CH₂)₄-O-EpEtTR-11:R³¹, R³²:- (CH₂)₉-O-EpEt;R³³:- (CH₂)₁₂-CH₃TR-12:R³¹, R³², R³³:- (CH₂)₉-O-CH=CH₂TR-13:R³¹, R³²:- (CH₂)₉-O-CH=CH₂;R³³:- (CH₂)₁₂-CH₃(**) EpEt: (CH₂) Epoxy ethyl [0076]

[Formula 20]

(TR-14 ~ 65)



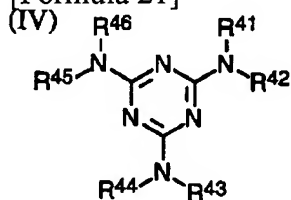
[0077] TR-14: X₁, X₂, X₃:-O-;R³², R³⁵, R³⁸:-O- 9-O-CO-CH=CH₂TR-15:X₁, X₂, X₃:-O-;R³¹, R³², R³⁴, R³⁵ and R³⁷, R³⁸:-O-(CH₂)₉-O-CO-CH=CH₂TR-16:X₁, X₂, X₃:-O-;R³², R³⁵, R³⁸:-O-(CH₂)₄-CH=CH-(CH₂)₄-O-CO-CH=CH₂TR-17: (CH₂) X₁, X₂, X₃:-O-;R³¹, R³², R³⁴, R³⁵ and R³⁷, R³⁸:-O-(CH₂)₄-CH=CH-(CH₂)₄-O-CO-CH=CH₂TR-18:X₁, X₂, X₃:-O-;R³¹, R³³, R³⁴, R³⁶ and R³⁷, R³⁹:-O- 9-O-CO-CH=CH₂TR-19: (CH₂) X₁, X₂, X₃:-O-;R³¹, R³², R³³, R³⁴, R³⁵, R³⁶, R³⁷ and R³⁸, R³⁹:-O-(CH₂)₉-O-CO-CH=CH₂TR-20:X₁, X₂:-O-;X₃:-NH-;R³², R³⁵, R³⁸:-O- 9-O-CO-CH=CH₂TR-21: (CH₂) X₁, X₂:-O-;X₃:-NH-;R³², R³⁵:-O- 4-O-CO-CH=CH₂;R³⁸:-O-(CH₂)₁₂-CH₃TR-22: (CH₂) X₁, X₂:-O-;X₃:-NH-;R³², R³⁵:-O- 4-O-CO-CH=CH₂;R³⁷, R³⁸:-O-(CH₂)₁₂-CH₃TR-23:X₁, X₂:-O-;X₃:-NH-;R³², R³⁵:-O-(CH₂)₄-O-CO-CH=CH₂;R³⁸:-O-CO-(CH₂)₁₁-CH₃TR-24: (CH₂) X₁:-O-;X₂, X₃:-NH-;R³¹, R³³:-O- 12-CH₃;R³⁵, R³⁸:-O-(CH₂)₉-O-CO-CH=CH₂TR-25: (CH₂) X₁:-O-;X₂, X₃:-NH-;R³¹, R³²:-O- 6-O-CO-CH=CH₂;R³⁵, R³⁸:-O-(CH₂)₁₁-CH₃TR-26:X₁:-O-;X₂, X₃:-NH-;R³¹, R³², R³³:-O-(CH₂)₆-O-CO-CH=CH₂;R³⁵, R³⁸:-O-(CH₂)₁₁-CH₃ [0078] TR-27: X₁, X₂:-NH-;X₃:-S-;R³², R³⁵:-O-(CH₂)₉-O-CO-CH=CH₂;R³⁸:-O-CO-(CH₂)₁₁-CH₃TR-28:X₁, X₂:-NH-;X₃:-S-;R³¹, R³² and R³⁴, R³⁵:-O- 9-O-CO-CH=CH₂;R³⁸:-O-CO-(CH₂)₁₁-CH₃TR-29: (CH₂) X₁, X₂:-NH-;X₃:-S-;R³², R³⁵:-O- 4-CH=CH-(CH₂)₄-O-CO-CH=CH₂;R³⁸:-O-CO-(CH₂)₁₁-CH₃TR-30: (CH₂) X₁, X₂:-NH-;X₃:-S-;R³¹, R³² and R³⁴, R³⁵:-O- 4-CH=CH-(CH₂)₄-O-CO-CH=CH₂;R³⁸:-O-CO-(CH₂)₁₁-CH₃TR-31: (CH₂) X₁, X₂:-NH-;X₃:-S-;R³¹, R³³ and R³⁴, R³⁶:-O- 9-O-CO-CH=CH₂;R³⁸:-O-CO-(CH₂)₁₁-CH₃TR-32: (CH₂) X₁, X₂:-NH-;X₃:-S-;R³¹, R³², R³³, R³⁴ and R³⁵, R³⁶:-O-(CH₂)₉-O-CO-CH=CH₂;R³⁸:-O-CO-(CH₂)₁₁-

CH₃TR-33:X1, X2:-O-;X3:-S-;R32, R35, R38:-O- 9-O-CO-CH=CH₂TR-34 : (CH₂) X1, X2:-O-;X3:-S-;R32, R35:-O- 4-O-CO-CH=CH₂;R38:-O- (CH₂) 12-CH₃TR-35:X1, X2:-O-;X3:-S-;R32, R35:-O- (CH₂)4-O-CO-CH=CH₂;R37, R38:-O-(CH₂)12-CH₃TR-36:X1, X2:-O-;X3:-S-;R32, R35:-O- (CH₂) 4-O-CO-CH=CH₂;R38:-O-CO- (CH₂) 11-CH₃TR-37:X1:-O-;X2, X3:-S-;R31, R33:-O-(CH₂)12-CH₃;R35, R38:-O-(CH₂)9-O-CO-CH=CH₂TR-38:X1:-O-;X2, X3:-S-;R31, R32:-O- (CH₂) 6-O-CO-CH=CH₂;R35, R38:-O-(CH₂)11-CH₃TR-39:X1:-O-;X2, X3:-S-;R31, R32, R33:-O-(CH₂)6-O-CO-CH=CH₂;R35, R38:-O- (CH₂) (CH₂) 11-CH₃ [0079] TR-40 : X1, X2, X3:-S-;R32, R35, R38:-O- 9-O-CO-CH=CH₂TR-41:X1, X2, X3:-S-;R31, R32, R34, R35 and R37, R38:-O-(CH₂)9-O-CO-CH=CH₂TR-42:X1, X2, X3:-S-;R32, R35, R38:-O- (CH₂) 4-CH=CH- (CH₂) 4-O-CO-CH=CH₂TR-43 : (CH₂) X1, X2, X3:-S-;R31, R32, R34, R35 and R37, R38:-O-(CH₂)4-CH=CH-(CH₂)4-O-CO-CH=CH₂TR-44:X1, X2, X3:-S-;R31, R33, R34, R36 and R37, R39:-O- 9-O-CO-CH=CH₂TR-45 : (CH₂) X1, X2, X3:-S-;R31, R32, R33, R34, R35, R36, R37 and R38, R39:-O-(CH₂)9-O-CO-CH=CH₂TR-46:X1, X2:-S-;X3:-NH-;R32, R35, R38:-O- 9-O-CO-CH=CH₂TR-47 : (CH₂) X1, X2:-S-;X3:-NH-;R32, R35:-O- (CH₂) 4-O-CO-CH=CH₂;R38:-O-(CH₂)12-CH₃TR-48:X1, X2:-S-;X3:-NH-;R32, R35:-O-(CH₂)4-O-CO-CH=CH₂;R37, R38:-O-(CH₂)12-CH₃ TR-49: X1, X2:-S-;X3:-NH-;R32, R35:-O-(CH₂)4-O-CO-CH=CH₂;R38:-O-CO-(CH₂)11-CH₃TR-50:X1:-O-;X2:-NH-;X3:-S-;R31, R33:-O- 12-CH₃;R35:-O- (CH₂) 9-O-CO-CH=CH₂;R38:-O- (CH₂) 12-CH₃TR-51 : (CH₂) Xone: -O-; X2:-NH-;X3:-S-;R31, R32:-O- 6-O-CO-CH=CH₂;R35:-O- (CH₂) 11-CH₃;R38:-O- (CH₂) 12-CH₃TR-52:X1:-O-;X2:-NH-;X3:-S-;R31, R32, R33:-O-(CH₂) <SUB>6-O-CO-CH=CH₂;R35:-O-(CH₂)11-CH₃;R38:-O- (CH₂) (CH₂) 12-CH₃ [0080] TR-53 : X1, X2, X3:-O-;R32, R35, R38:-O- 9-O-EpEtTR-54:X1, X2, X3:-O-;R31, R32, R34, R35 and R37, R38:-O-(CH₂)9-O-EpEtTR-55:X1, X2, X3:-O-;R32, R35, R38:-O- (CH₂) 4-CH=CH- (CH₂) 4-O-EpEtTR-56 : (CH₂) X1, X2, X3:-O-;R31, R32, R34, R35 and R37, R38:-O-(CH₂)4-CH=CH-(CH₂)4-O-EpEtTR-57:X1, X2, X3:-O-;R31, R33, R34, R36 and R37, R39:-O- 9-O-EpEtTR-58:X1, X2, X3:-O-;R32, R35, R38:-O-(CH₂)9-O-CH=CH₂TR-59:X1, X2:-O-;X3:-NH-;R32, R35, R38:-O- (CH₂) 9-O-EpEtTR-60:X1, X2:-O-;X3:-NH-;R32, R35:-O-(CH₂)4-O-EpEt;R38:-O-(CH₂)12-CH₃TR-61:X1, X2:-O-;X3:-NH-;R32, R35:-O- (CH₂) 4-O-EpEt;R37 and R38:-O- (CH₂) 12-CH₃TR-62:X1, X2:-O-;X3:-NH-;R32, R35:-O-(CH₂)4-O-EpEt;R38:-O-CO-(CH₂)11-CH₃TR-63:X1:-O-;X2, X3:-NH-;R31, R33:-O- (CH₂) 12-CH₃;R35, R38:-O- (CH₂) 9-O-EpEtTR-64 : (CH₂) X1: -O-;X2, X3:-NH-;R31, R32:-O- R without R38[6-O-EpEt;R35, R38:-O-(CH₂)11-CH₃TR-65:X1, X2:-O-;X3:-NH-;R32, R35, and]:-O-(CH₂)9-O-CH=CH₂ (**) definition: (CH₂) Permuting [no] (hydrogen atom).

EpEt: Epoxy ethyl [0081] As for the compound which has a 1,3,5-triazine ring, it is desirable that it is the melamine compound expressed with the following type (IV).

[0082]

[Formula 21]



[0083] The carbon atomic number of R41, R43, and R45 is the alkyl group or hydrogen atom of 1 thru/or 30 independently among a formula, respectively, it is an alkyl group, an alkenyl radical, an aryl group, or a heterocycle radical independently, or R41, R42, R43 and R44, or R45 and R46 join together, and R42, R44, and R46 form heterocycle, respectively. It is desirable that a carbon atomic number is the alkyl group or hydrogen atom of 1 thru/or 20, it is more desirable that a carbon atomic number is the alkyl group or hydrogen atom of 1 thru/or 10, as for R41, R43, and R45, it is still more desirable that a carbon atomic number is the alkyl group or hydrogen atom of 1 thru/or 6, and it is most desirable that it is a hydrogen atom. As for R42, R44, and R46, it is desirable that it is especially an aryl group. A definition and substituent of the above-mentioned alkyl group, an alkenyl radical, an aryl group, and a

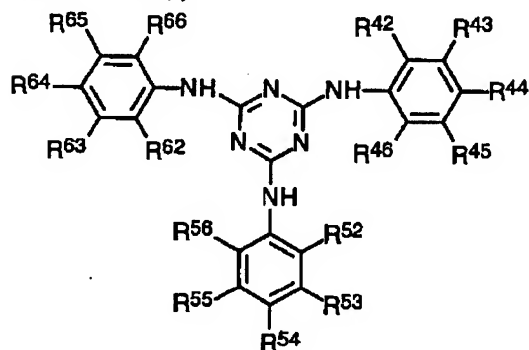
heterocycle radical are the same as the definition and substituent of each radical which were explained by said formula (III). The heterocycle which R41, R42, R43 and R44, or R45 and R46 combine and form is the same as that of the heterocycle radical which has a residual valence in the nitrogen atom explained by said formula (III).

[0084] As for at least one of R42, R44, and the R46, it is desirable that a carbon atomic number contains the alkylene parts or alkenylene parts of 9 thru/ or 30. As for the alkylene parts or alkenylene parts of 9 thru/ or 30, it is desirable that a carbon atomic number is a straight chain-like. As for an alkylene part or an alkenylene part, being contained in the substituent of an aryl group is desirable. Moreover, as for at least one of R42, R44, and the R46, it is desirable to have a polymerization nature machine as a substituent. As for a melamine compound, it is desirable to have at least two polymerization nature machines. Moreover, as for a polymerization nature machine, it is desirable to be located in the end of R42, R44, and R46. It can be made to contain in an optical anisotropy layer in the condition that the melamine compound and the discotheque liquid crystallinity molecule are carrying out the polymerization by introducing a polymerization nature machine into a melamine compound. R42, R44, and R46 which have a polymerization nature machine as a substituent are the same as that of the radical shown by the formula (Rp) mentioned above.

[0085] The example of a melamine compound is shown below.

[0086]

[Formula 22]
(MM-1 ~ 4 6)



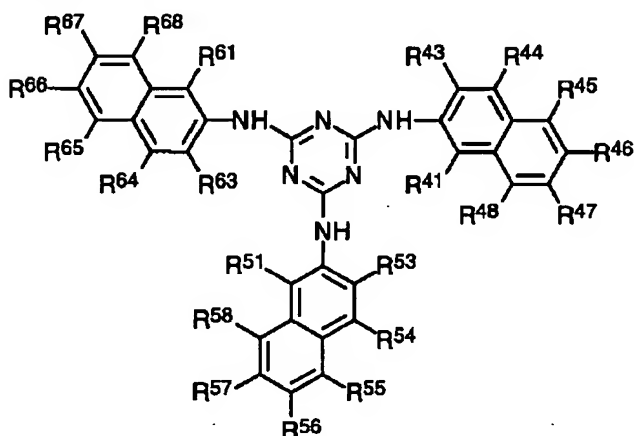
[0087] MM-1: R43, R44, R53, R54 and R63, R64:-O-(CH₂)₉-CH₃MM-2:R43, R44, R53, R54 and R63, R64:-O-(CH₂)₁₁-CH₃MM-3:R43, R44, R53, R54 and R63, R64:-O-15-CH₃MM-4:R44, R54, R64:-O-(CH₂)₉-CH₃MM-5:R44, R54, R64:-O-(CH₂)₁₅-CH₃MM-6:R43, R53, R63:-O-CH₃;R44, R54, R64:-O-(CH₂)₁₇-CH₃MM-7:R44, R54, R64:-CO-O-(CH₂)₁₁-CH₃MM-8:R44, R54, R64:-SO₂-NH-(CH₂)₁₇-CH₃MM-9:R43, R53, R63:-O-CO-(CH₂)₁₅-CH₃MM-10:(CH₂)₄R42, R52, R62:-O-17-CH₃MM-11:R42, R52, R62:-O-CH₃;R43, R53, R63:-CO-O-(CH₂)₁₁-CH₃MM-12:R42, R52, R62:-Cl;R43, R53, R63:-CO-O-(CH₂)₁₁-CH₃MM-13:R42, R52, R62:-O-(CH₂)₁₁-CH₃;R45, R55, R65:-SO₂-NH-iso-C₃H₇[0088] MM-14: R42, R52, R62:-Cl;R45, R55, R65:-SO₂-NH-(CH₂)₁₅-CH₃MM-15:R42, R46, R52, R56 and R62, R66:-Cl;R45, R55, R65:-SO₂-NH-19-CH₃MM-16:R43, R54:-O-(CH₂)₉-CH₃; (CH₂)₄R44, R53, R63, R64:-O-11-CH₃MM-17:R44:-O-(CH₂)₁₁-CH₃;R54:-O-(CH₂)₁₅-CH₃;R64:-O-(CH₂)₁₇-CH₃MM-18:R42, R45, R52, R55 and R62, R65:-O-CH₃;R44, R54, R64:-NH-CO-(CH₂)₁₄-CH₃MM-19:R42, R45, R52, R55 and R62, R65:-O-(CH₂)₃-CH₃;R44, R54, R64:-O-(CH₂)₁₅-CH₃MM-20:(CH₂)₄R42, R52, R62:-NH-SO₂-15-CH₃; (CH₂)₄R44, R45, R54, R55, R64, R65:-ClMM-21: R42, R43, R52, R53, R62, R63:-F;R44, R54, R64:-CO-NH-15-CH₃; (CH₂)₄R45, R46, R55, R56, R65, R66:-ClMM-22: R42, R52, R62:-Cl;R44, R54, R64:-CH₃;R45, R55, R65:-NH-CO-(CH₂)₁₂-CH₃MM-23:R42, R52, R62:-OH;R44, R54, R64:-CH₃;R45, R55, R65:-O-15-CH₃MM-24:R42, R45, R52, R55 and R62, R65:-O-CH₃;R44, R54, R64:-O-(CH₂)₁₁-CH₃MM-25:R42, R52, R62:-NH-SO₂-CH₃;R45, R55, R65:-CO-O-(CH₂)₁₁-CH₃MM-26:R42, R52, R62:-S-(CH₂)₁₁-CH₃;R45, R55, R65:-SO₂-NH₂ [0089] MM-27: R43, R44, R53, R54, R63, R64:-O-12-O-CO-CH=CH₂MM-28:R43, R44, R53, R54 and R63, R64:-O-(CH₂)₈-O-CO-CH=CH₂MM-29:R43, R44,

R53, R54 and R63, R64:-O-CO-(CH₂) 7-O-CO-CH=CH₂MM-30:R44, R54, R64:-CO-O-(CH₂)12-O-CO-C(CH₃) =CH₂MM-31:R43, R44, R53, R54 and R63, R64</SUP>:-O-CO-p-Ph-O- (CH₂) 4-O-CO-CH=CH₂MM-32 : (CH₂) R42, R44, R52, R54, R62, R64:-NH-SO₂-(CH₂)8-O-CO-CH=CH₂;R45, R55, R65:-C1MM-33:R42, R52, R62:-NH-SO₂-CH₃;R45, R55, R65:-CO-O- (CH₂) 12-O-CO-CH=CH₂ [0090] MM-34: R44, R54, R64:-O- 9-O-CO-CH=CH₂MM-35:R43, R44, R53, R54 and R63, R64:-O- (CH₂)9-O-CO-CH=CH₂MM-36:R44, R54, and R64:-O-(CH₂)4-CH=CH- (CH₂) 4-O-CO-CH=CH₂MM-37:R43, R44, R53, R54 and R63, R64:-O-(CH₂)4-CH=CH-(CH₂)4-O-CO-CH=CH₂MM-38:R43, R45, R53, R55 and R63, R65:-O- (CH₂) 9-O-CO-CH=CH₂MM-39 : (CH₂) R43, R44, R45, R53, R54, R55, R63, R64, R65:-O- 9-O-CO-CH=CH₂MM-40 : (CH₂) R44, R54:-O- 4-O-CO-CH=CH₂;R64:-O- (CH₂) 9-O-CO-CH=CH₂MM-41:R44, R54:-O-(CH₂)4-O-CO-CH=CH₂;R64:-O-(CH₂)12-CH₃MM-42:R44, R54:-O-(CH₂)4-O-CO-CH=CH₂;R63, R64:-O- (CH₂) 12-CH₃MM-43:R44, R54:-O- (CH₂) 4-O-CO-CH=CH₂;R63, R64:-O-CO-(CH₂)11-CH₃MM-44:R43, R45:-O-(CH₂)12-CH₃;R54, R64:-O-(CH₂)9-O-CO-CH=CH₂MM-45:R43, R44:-O- (CH₂) (CH₂) 6-O-CO-CH=CH₂;R54, R64:-O-(CH₂)11-CH₃MM-46:R43, R44, R45:-O-(CH₂)6-O-CO-CH=CH₂;R54, R64:-O-(CH₂)11-CH₃ R without a definition: (**) Permuting [no] (hydrogen atom).

p-Ph:p-phenylene [0091]

[Formula 23]

(MM- 4 7 ~ 5 9)

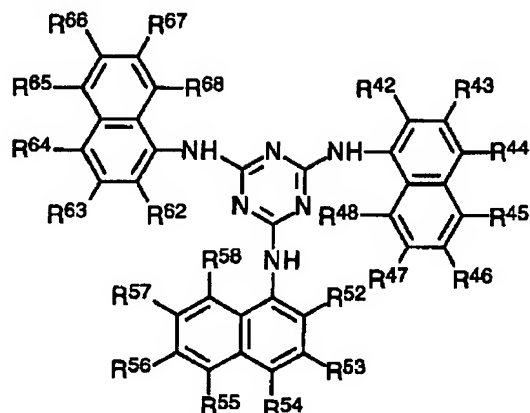


[0092] MM-47: R46, R56, R66:-SO₂-NH- 15-CH₃;R48, R58, R68:-O- (CH₂) 11-CH₃MM-48:R45, R55, R65:-SO₂-NH-(CH₂)17-CH₃MM-49:R46, R56, R66:-SO₂-NH-(CH₂)15-CH₃MM-50:R45, R55, R65:-O- (CH₂) 17-CH₃; (CH₂) R47, R57, R67: - SO₂-NH-CH₃MM-51:R43, R53, R63:-O-(CH₂)15-CH₃MM-52:R41, R51, R61:-O-(CH₂)17-CH₃MM-53:R46, R56, R66:-SO₂-NH-Ph;R48, R58, R68:-O- 11-CH₃MM-54 : (CH₂) R45, R55, R65:-O- 21-CH₃;R47, R57, R67:-SO₂-NH-PhMM-55:R41, R51, R61:-p-Ph-(CH₂)11-CH₃MM-56:R46, R48, R56, R58 and R66, R68:-SO₂-NH- (CH₂) 7-CH₃MM-57:R46, R56, R66:-SO₂-NH-(CH₂)10-O-CO-CH=CH₂;R48, R58, R68:-O-(CH₂)12-CH₃MM-58:R45, R55, R65:-O- (CH₂) R without R63[12-O-CO-CH=CH₂;R47, R57, R67:-SO₂-NH-PhMM-59:R43, R53, and]:-O-(CH₂)16-O-CO-CH=CH₂ (**) definition: (CH₂) Permuting [no] (hydrogen atom).

Ph: Phenyl p-Ph:p-phenylene [0093]

[Formula 24]

(MM-60~71)

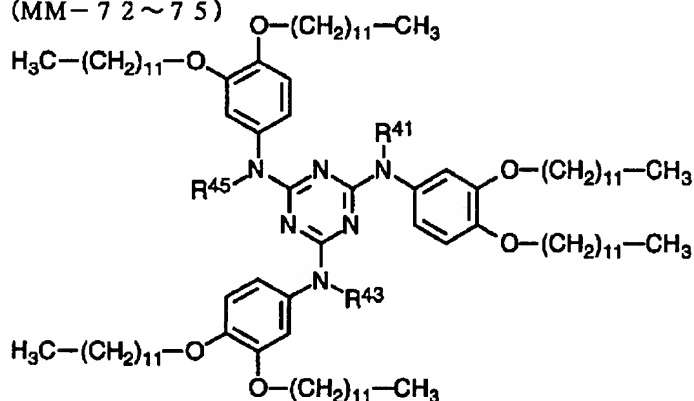


[0094] MM-60: R45, R55, R65:-NH-CO-14-CH₃MM-61:R42, R52, R62:-O-(CH₂)₁₇-CH₃MM-62:R44, R54, R64:-O-(CH₂)₁₅-CH₃MM-63:R45, R55, R65:-SO₂-NH-(CH₂)₁₅-CH₃MM-64:R43, R53, R63:-CO-NH-(CH₂)₁₇-CH₃;R44, R54, R64:-OHMM-65:R45, R55, R65:-O-(CH₂)₁₅-CH₃;R46, R56, R66:-SO₂-NH-(CH₂)₁₁-CH₃MM-66:R47, R57, R67:-O-(CH₂)₂₁-CH₃MM-67:R44, R54, R64:-O-p-Ph-(CH₂)₁₁-CH₃MM-68:R46, R56, R66:-SO₂-NH-(CH₂)₁₅-CH₃MM-69:R43, R53, R63:-CO-NH-(CH₂)₁₇-CH₃;R44, R54, R64:-O-(CH₂)₁₂-O-CO-CH=CH₂MM-70:R45, R55, R65:-O-(CH₂)₈-O-CO-CH=CH₂;R46, R56, R66:-SO₂-NH-(CH₂)₁₁-CH₃MM-71:R43, R46, R53, R56 and R63, R66:-SO₂-NH-(CH₂)₈-O-CO-CH=CH₂ (CH₂) R without a definition: (**) Permuting [no] (hydrogen atom).

p-Ph:p-phenylene [0095]

[Formula 25]

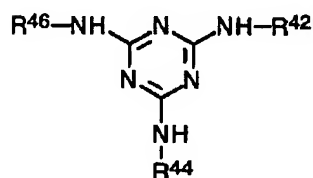
(MM-72~75)



[0096] MM-72: R41, R43, R45:-CH₃MM-73:R41, R43, R45:-C₂H₅MM-74:R41, R43:-C₂H₅;R45:-CH₃MM-75:R41, R43, R45:-O-(CH₂)₃-CH₃ [0097]

[Formula 26]

(MM-76~88)

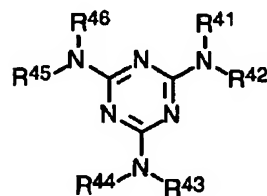


[0098] MM-76: R42, R44, R46:-9-O-CO-CH=CH₂MM-77:R42, R44, R46:-O-CO-CH=CH₂MM-78:R42, and R44:-O-CO-CH=CH₂ (CH₂) ; R46:-12-CH₃MM-79:R42, R44:-O-CO-CH=CH₂ (CH₂) 4-CH=CH-(CH₂) 4-O-CO-CH=CH₂;R46:-O-CO-CH=CH₂ (CH₂) 12-CH₃MM-80:R42:-O-CO-CH=CH₂ (CH₂) 9-O-CO-

CH=CH₂;R₄₄, R₄₆:- (CH₂) 12-CH₃MM-81:R₄₂:- (CH₂)₄-CH=CH-(CH₂)₄-O-CO-CH=CH₂;R₄₄, R₄₆:- (CH₂)₁₂-CH₃MM-82:R₄₂, and R₄₄:- (CH₂)₄-O-CO-CH=CH₂ (CH₂) ; R₄₆:- 12-CH₃MM-83:R₄₂:- (CH₂) 4-O-CO-CH=CH₂ (CH₂) ; R₄₄, R₄₆:- 12-CH₃MM-84:R₄₂, R₄₄, R₄₆:- (CH₂)₉-O-EpEtMM-85:R₄₂, R₄₄, R₄₆:- (CH₂)₄-CH=CH-(CH₂)₄-O-EpEtMM-86:R₄₂, R₄₄:- (CH₂) 9-O-EpEt;R₄₆:- (CH₂) 12-CH₃MM-87:R₄₂, R₄₄, R₄₆:- (CH₂)₉-O-CH=CH₂MM-88:R₄₂, R₄₄:- (CH₂)₉-O-CH=CH₂;R₄₆:- (CH₂)₁₂-CH₃(**) EpEt: (CH₂) Epoxy ethyl [0099]

[Formula 27]

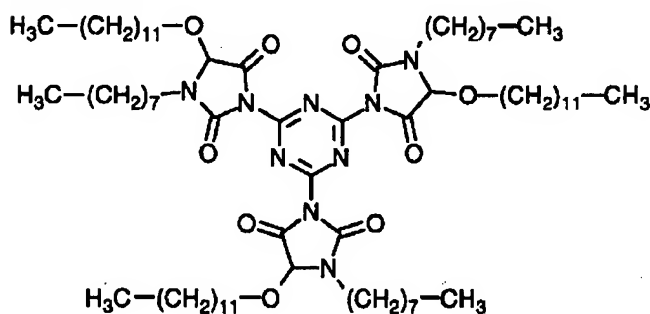
(MM-89~95)



[0100] MM-89: R₄₁, R₄₂, R₄₃, R₄₄ and R₄₅, R₄₆:- (CH₂)₉-CH₃MM-90:R₄₁, R₄₃, R₄₅:-CH₃;R₄₂, R₄₄, R₄₆:- (CH₂)₁₇-CH₃MM-91:R₄₁, R₄₂ and R₄₃, R₄₄:- 7-CH₃;R₄₅, R₄₆:- (CH₂) 5-CH₃MM-92 : (CH₂) R₄₁, R₄₂, R₄₃, R₄₄, R₄₅, R₄₆:- CyHxMM-93:R₄₁, R₄₂, R₄₃, R₄₄ and R₄₅, R₄₆:- (CH₂)₂-O-C₂H₅MM-94:R₄₁, R₄₃, R₄₅:-CH₃;R₄₂, R₄₄, R₄₆:- 12-O-CO-CH=CH₂MM-95:R₄₁, R₄₂, R₄₃, R₄₄ and R₄₅, R₄₆:- (CH₂)₈-O-CO-CH=CH₂(**) CyHx: (CH₂) Cyclohexyl [0101]

[Formula 28]

(MM-96)

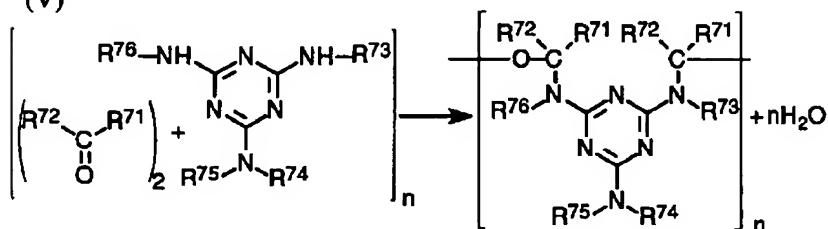


[0102] A melamine polymer may be used as a melamine compound. As for a melamine polymer, it is desirable to compound by the polymerization reaction of the melamine compound and carbonyl compound which are shown by the following formula (V).

[0103]

[Formula 29]

(V)



[0104] R₇₁, R₇₂, R₇₃, R₇₄, R₇₅, and R₇₆ are a hydrogen atom, an alkyl group, an alkenyl radical, an aryl group, or a heterocycle radical independently among a formula, respectively. A definition and substituent of the above-mentioned alkyl group, an alkenyl radical, an aryl group, and a heterocycle radical are the same as the definition and substituent of each radical which were explained by said formula (III). The polymerization reaction of a melamine compound and a carbonyl compound is the same as that of the synthetic approach of usual melamine resin (an example, melamine formaldehyde

resin). A commercial melamine polymer (melamine resin) may be used. As for the molecular weight of a melamine polymer, it is desirable that it is [or more 2000] 400,000 or less.

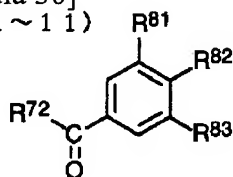
[0105] As for at least one of R71, R72, R73, R74, R75, and the R76, it is desirable that a carbon atomic number contains the alkylene parts or alkenylene parts of 9 thru/ or 30. As for the alkylene parts or alkenylene parts of 9 thru/ or 30, it is desirable that a carbon atomic number is a straight chain-like. As for an alkylene part or an alkenylene part, being contained in the substituent of an aryl group is desirable. Moreover, as for at least one of R71, R72, R73, R74, R75, and the R76, it is desirable to have a polymerization nature machine as a substituent. Moreover, as for a polymerization nature machine, it is desirable to be located in the end of R71, R72, R73, R74, R75, and R76. It can be made to contain in an optical anisotropy layer in the condition that the melamine polymer and the discotheque liquid crystallinity molecule are carrying out the polymerization by introducing a polymerization nature machine into a melamine polymer. R71, R72, R73, R74, R75, and R76 which have a polymerization nature machine as a substituent are the same as that of the radical shown by the formula (Rp) mentioned above. What is necessary is just to introduce a polymerization nature machine into one side of a carbonyl compound (R71, R72) and a melamine compound (R73, R74, R75, R76). When a melamine compound has a polymerization nature machine, the compound of the easy chemical structure [like formaldehyde] whose carbonyl compound is is used preferably. When a carbonyl compound has a polymerization nature machine, the compound of the easy chemical structure [like a melamine (permuring / no /)] whose melamine compound is is used preferably.

[0106] The example of the carbonyl compound which has a polymerization nature machine is shown below.

[0107]

[Formula 30]

(CO-1 ~ 1 1)

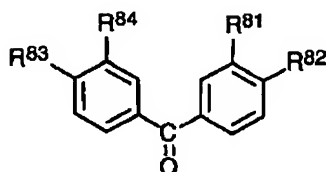


[0108] CO-1: R72:-H;R82:-O-9-O-CO-CH=CH2CO-2:(CH2)R72:-H;R81 and R82:-O-9-O-CO-CH=CH2CO-3:R72:-H;R82:-O-(CH2)4-CH=CH-(CH2)4-O-CO-CH=CH2CO-4:R72:-H;R81 and R82:-O-(CH2)4-CH=CH-(CH2)4-O-CO-CH=CH2CO-5:(CH2)R72:-H;R81 and R83:-O-9-O-CO-CH=CH2CO-6:R72:-H;R81, R82, R83:-O-(CH2)9-O-CO-CH=CH2CO-7:R72:-CH3;R82:-O-(CH2)9-O-CO-CH=CH2CO-8:R72:-O-(CH2)11-CH3;R82:-O-(CH2)4-O-CO-CH=CH2CO-9:R72:-O-(CH2)9-O-CO-CH=CH2;R82:-O-(CH2)4-O-CO-CH=CH2CO-10:R72:-O-(CH2)R without R83[9-O-CO-EpEt;R82:-O-(CH2)4-O-CO-CH=CH2CO-11:R72:-O-(CH2)4-O-CO-CH=CH2;R81 and]:-O-(CH2)12-CH3 (**) definition: (CH2) Permuring [no] (hydrogen atom).

EpEt: Epoxy ethyl [0109]

[Formula 31]

(CO-1 2 ~ 1 3)

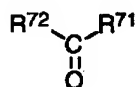


[0110] CO-12: R without R83[R81, R82 and R83, R84:-O-(CH2)6-O-CO-CH=CH2CO-13:R82, and]:-O-(CH2)9-O-CO-CH=CH2 (**) definition: Permuring [no] (hydrogen atom).

[0111]

[Formula 32]

(CO-14~26)

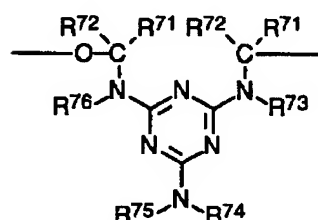


[0112] CO-14:R71:- (CH₂)₉-O-CO-CH=CH₂; R72:-HCO-15:R71:- (CH₂)₄-CH=CH- (CH₂)₄-O-CO-CH=CH₂; R72:-HCO-16:R71:- (CH₂)₉-O-CO-CH=CH₂; R72:-CH₃CO-17:R71:- (CH₂)₄-CH=CH- (CH₂)₄-O-CO-CH=CH₂; R72:-CH₃CO-18:R71:- (CH₂)₉-O-CO-CH=CH₂; R72:-PhCO-19:R71:- (CH₂)₄-CH=CH- (CH₂)₄-O-CO-CH=CH₂; R72:-P hCO-20:R71:- (CH₂)₄-O-CO-CH=CH₂; R72:- 9-O-CO-CH=CH₂CO-21:R71:- (CH₂)₄-O-CO-CH=CH₂; R72:- (CH₂)₁₂-CH₃CO-22:R71:- (CH₂)₉-O-EpEt; R72:-HCO-23:R71:- (CH₂)₄-CH=CH- (CH₂)₄-O-EpEt; R72:-HCO-24:R71, R72:- (CH₂)₉-O-EpEtCO-25:R71, R72:- (CH₂)₉-O-CO-CH=CH₂CO-26:R71, R72:- (CH₂)₄-CH=CH- (CH₂)₄-O-CO-CH=CH₂(**) Ph:phenyl EpEt: (CH₂) Epoxy ethyl [0113] The example of the melamine polymer which has a polymerization nature machine in a melamine compound side is shown below.

[0114]

[Formula 33]

(MP-1~14)



[0115] MP-1: R73, R75, R76:-CH₂-NH-CO-CH=CH₂; R74:-CH₂-NH-CO-(CH₂)₈-CH₃MP-2:R71:-CH₃; R73, R75, R76:-CH₂-NH-CO-CH=CH₂; R74:-CH₂-NH-CO- 8-CH₃MP-3 : (CH₂) R71, R72: -CH₃; R73, R75, R76:-CH₂-NH-CO-CH=CH₂; R74:-CH₂-NH-CO-(CH₂)₈-CH₃MP-4:R71 :-P h; R73, R75, R76:-CH₂-NH-CO-CH=CH₂; R74:-CH₂-NH-CO- 8-CH₃MP-5 : (CH₂) R73, R76: -CH₂-NH-CO-CH=CH₂; R74:-CH₂-NH-CO-(CH₂)₇-CH=CH-(CH₂)₇-CH₃; R75:-CH₂-O-CH₃MP-6:R73, R76:-CH₂-NH-CO-CH=CH₂; R74:-CH₂-NH-CO- 7-CH=CH- (CH₂)₇-CH₃; (CH₂) R75:-CH₂-OHMP-7 : R73, R76:-CH₂-NH-CO-C₂H₅; R74:-CH₂-NH-CO-(CH₂)₁₆-CH₃; R75:-CH₂-O-CH₃MP-8:R73, R76:-CH₂-NH-CO-C₂H₅; R74:-CH₂-NH-CO- 16-CH₃; (CH₂) R75: -CH₂-OHMP-9 : R73, R76: -CH₂-O-CO-CH=CH₂; R74:-CH₂-O-CO-(CH₂)₇-CH=CH-(CH₂)₇-CH₃; R75:-CH₂-O-CH₃MP-10:R73, R76:-CH₂-O-CO-CH=CH₂; R74:-CH₂-O-CO- 7-CH=CH- (CH₂)₇-CH₃; (CH₂) R75: -CH₂-OHMP-11 : R73, R76:-CH₂-O-CO- 7-CH=CH- (CH₂)₇-CH₃; R74:-CH₂-NH-CO- (CH₂)₇-CH=CH- (CH₂)₇-CH₃; R75:-CH₂-O-CH₃MP-12:R73, R76:-CH₂-O-CO-(CH₂)₇-CH=CH-(CH₂)₇-CH₃; R74:-CH₂-NH-CO-(CH₂)₇-CH=CH- (CH₂)₇-CH₃; R75:-CH₂-OHMP-13:R73, R74 and R75, R76:-CH₂-O-(CH₂)₁₁-O-CO-CH=CH₂MP-14:R73, R75, R76:-CH₂-NH-CO-CH=CH₂; R74:-CH₂-O- (CH₂) R without 16-CH₃ (**) definition: (CH₂) Permuting [no] (hydrogen atom).

Ph: Phenyl [0116] The compound (a melamine compound and a melamine polymer are included) which has two or more kinds of 1,3,5-triazine rings may be used together. It is desirable to use it in 0.01 thru/or 20% of the weight of the amount of the amount of a discotheque liquid crystallinity molecule, as for the compound which has a 1,3,5-triazine ring, it is still more desirable to use it in 0.1 thru/or 15% of the weight of an amount, and it is most desirable to use it in 0.5 thru/or 10% of the weight of an amount. The coverage of a compound which has a 1,3,5-triazine ring is 1 thru/or 1000 mg/m². It is desirable that it is the range and they are 2 thru/or 300 mg/m². It is still more desirable that it is the range and they are 3 thru/or 100 mg/m². It is most desirable that it is the range.

[0117] An optical anisotropy layer forms the liquid crystal constituent (coating liquid) containing a discotheque liquid crystallinity molecule or the following polymerization nature initiator, or the additive (an example, a plasticizer, a monomer, a surface active agent, cellulose ester, a 1,3,5-triazine compound, chiral agent) of arbitration by applying on the orientation film. As a solvent used for preparation of a

liquid crystal constituent, an organic solvent is used preferably. An amide (an example, N,N-dimethylformamide), a sulfoxide (an example, dimethyl sulfoxide), a heterocycle compound (an example, pyridine), a hydrocarbon (an example, benzene, hexane), alkyl halide (an example, chloroform, dichloromethane), ester (an example, methyl acetate, butyl acetate), a ketone (an example, an acetone, methyl ethyl ketone), and the ether (an example, a tetrahydrofuran, 1, 2-dimethoxyethane) are contained in the example of an organic solvent. Alkyl halide and a ketone are desirable. Two or more kinds of organic solvents may be used together. Spreading of a liquid crystal constituent can be carried out by the well-known approach (an example, a wire bar coating method, an extrusion coating method, the direct gravure coating method, the reverse gravure coating method, die coating method).

[0118] The thermal polymerization reaction which uses a thermal polymerization initiator, and the photopolymerization reaction using a photopolymerization initiator are included in the polymerization reaction of a discotheque liquid crystallinity molecule. A photopolymerization reaction is desirable. the example of a photopolymerization initiator -- alpha-carbonyl compound (a U.S. Pat. No. 2367661 number --) Each specification publication of said 2367670 numbers, the acyloin ether (U.S. Pat. No. 2448828 number specification publication), alpha-hydrocarbon permutation aromatic series acyloin compound (U.S. Pat. No. 2722512 number specification publication), a polykaryotic quinone compound (a U.S. Pat. No. 3046127 number -- said -- each specification publication of No. 2951758) -- The combination of a thoria reel imidazole dimer and p-aminophenyl ketone (U.S. Pat. No. 3549367 number specification publication), An acridine, a phenazine compound (JP,60-105667,A, U.S. Pat. No. 4239850 number specification publication), and an oxadiazole compound (U.S. Pat. No. 4212970 number specification publication) are contained. As for the amount of the photopolymerization initiator used, it is desirable that they are 0.01 of the solid content of coating liquid thru/or 20 % of the weight, and it is still more desirable that they are 0.5 thru/or 5 % of the weight. As for the optical exposure for the polymerization of a discotheque liquid crystallinity molecule, it is desirable to use ultraviolet rays. exposure energy -- 20 mJ/cm² Or 50 J/cm² it is -- things -- desirable -- 100 thru/or 800 mJ/cm² it is -- things are still more desirable. In order to promote a photopolymerization reaction, an optical exposure may be carried out under heating conditions. It is desirable that they are 0.1 thru/or 20 micrometers, as for the thickness of an optical anisotropy layer, it is still more desirable that they are 0.5 thru/or 15 micrometers, and it is most desirable that they are 1 thru/or 10 micrometers.

[0119] There are iodine system polarization film, and the color system polarization film and polyene system polarization film which use dichromatic dye as [polarization film] polarization film. Generally the iodine system polarization film and the color system polarization film are manufactured using a polyvinyl alcohol system film. The polarization shaft of the polarization film corresponds in the direction perpendicular to the extension direction of a film. As for the transparency shaft within the field of the polarization film, it is desirable to arrange so that it is parallel or may intersect perpendicularly with the lagging axis of a transparence base material substantially.

[0120] A transparent polymer film is used as a [transparence protective coat] transparence protective coat. It means that light transmittance is 80% or more as a protective coat is transparent. as a transparence protective coat -- general -- a cellulose ester film -- a triacetyl cellulose film is used preferably. As for a cellulose ester film, forming by the solvent cast method is desirable. As for the thickness of a transparence protective coat, it is desirable that they are 20 thru/or 500 micrometers, and it is still more desirable that they are 50 thru/or 200 micrometers.

[0121] [Liquid crystal display] this invention is applicable to the liquid crystal cell of various display modes. As mentioned above, the optical compensation sheet using a liquid crystallinity molecule TN (Twisted Nematic), IPS (In-Plane Switching), FLC (Ferroelectric Liquid Crystal), OCB (OpticallyCompensatory Bend), STN (Supper Twisted Nematic), VA (VerticallyAligned), The thing corresponding to the liquid crystal cell in ECB (Electrically Controlled Birefringence) and HAN (Hybrid Aligned Nematic) mode is already proposed. This invention is effective in the liquid crystal display using a liquid crystal cell like VA mode with many cylindrical liquid crystallinity molecules which are carrying out orientation perpendicularly substantially, OCB mode, and HAN mode, and effective especially in the liquid crystal display in VA mode in which most cylindrical liquid crystallinity

molecules are carrying out orientation perpendicularly substantially. Orientation of the (1) cylindrical liquid crystallinity molecule is substantially carried out to the liquid crystal cell in VA mode perpendicularly at the time of no electrical-potential-difference impressing. To the liquid crystal cell (JP,2-176625,A publication) in VA mode of the narrow sense which carries out orientation horizontally substantially at the time of electrical-potential-difference impression, in addition, a (2) angle-of-visibility expansion sake, The liquid crystal cell which formed VA mode into the multi-domain (MVA mode) (SID97, Digest of tech.Papers(collection of drafts)28 (1997) 845 publication), (3) Perpendicular orientation of the cylindrical liquid crystallinity molecule is substantially carried out at the time of no electrical-potential-difference impressing. The liquid crystal cell (58 to collection of drafts 59 (1998) publication of a Japanese liquid crystal debate) in the mode (n-ASM mode) which can twist at the time of electrical-potential-difference impression, and carries out multi-domain orientation, and the liquid crystal cell (LCD International 98 announces) in (4) SURVAIVAL mode are contained.

[0122]

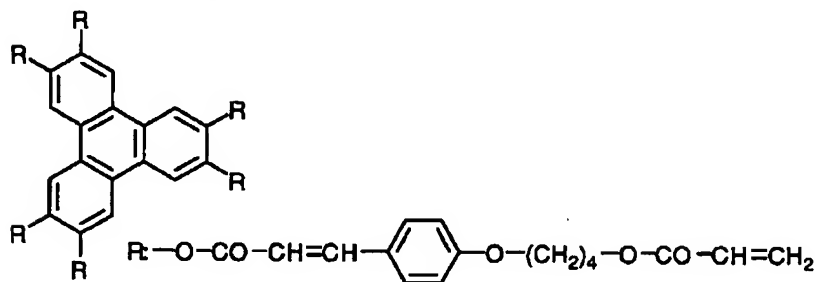
[Example] [Example 1]

(Production of an optical compensation sheet) Cellulose diacetate was applied, it dried to one field of a cellulose triacetate film, and the under coat (orientation film which has not carried out rubbing processing) whose desiccation thickness is 0.5 micrometers was formed in it. The following discotheque liquid crystallinity molecule (1) 90 weight section, the ethyleneoxide denaturation trimethylolpropane triacrylate (V#360, product made from Osaka Organic chemistry) 10 weight section, melamine formaldehyde / acrylic-acid copolymer (Aldrich reagent) 0.6 weight section, the photopolymerization initiator (IRGACURE 907, Ciba-Geigy Japan make) 3.0 weight section, and the photosensitizer (kaya KYUA DETX, Nippon Kayaku Co., Ltd. make) 1.0 weight section were dissolved in the methyl ethyl ketone, and the coating liquid whose solid content concentration is 38 % of the weight was prepared.

[0123]

[Formula 34]

ディスコティック液晶性化合物 (1)



[0124] Coating liquid was applied on the under coat and it dried. It heated for 2 minutes at 130 degrees C, and orientation of the discotheque liquid crystallinity molecule was carried out. It cooled to the room temperature immediately, the ultraviolet rays of 500 mJ/cm² were irradiated, the polymerization of the discotheque liquid crystallinity molecule was carried out, and the orientation condition was fixed. The thickness of the formed optical anisotropy layer was 1.7 micrometers. The angular dependence of the retardation of an optical anisotropy layer was measured by the ellipsometer (Jasco Corp. make). Consequently, the retardation (Rth) of 0.2 degrees and the thickness direction of the average tilt angle of a discotheque liquid crystallinity molecule was 88nm.

[0125] The binder was used for the field of another side of a cellulose triacetate film, the polycarbonate film which has optical optically uniaxial was stuck, and the optical compensation sheet was produced. The polycarbonate film which has optical optically uniaxial has an optical axis in a field, and the retardation within a field (Re) is a retardation of 50nm and the thickness direction. It was nm. The retardation (Rth) of 50nm and the thickness direction of the retardation within a field of the produced whole optical compensation sheet (Re) was 100nm.

[0126] (Production of an elliptically-polarized-light plate) To the transparence base material

(polycarbonate film) side of an optical compensation sheet, the laminating of the polarization film and the transpance protective coat was carried out to this order, and the elliptically-polarized-light plate was produced. The lagging axis of a transpance base material and the polarization shaft of the polarization film have been arranged so that it may become parallel.

[0127] (Production of a liquid crystal display) The elliptically-polarized-light plate was deleted from commercial VA liquid crystal display (LCD5000), and the elliptically-polarized-light plate produced instead was stuck. When the contrast data of an omnidirection were measured about produced VA liquid crystal display, the angle of visibility from which a contrast ratio 20:1 is obtained was 160 degrees of four directions. On the other hand, in commercial VA liquid crystal display (LCD5000), the angle of visibility from which a contrast ratio 20:1 is obtained was 120 degrees of four directions.

[0128] [Example 2]

(Production of an optical optically biaxial transpance base material) The cellulose triacetate 87 weight section, the triphenyl phosphate 10 weight section, and the ultraviolet ray absorbent (TM165, Sumitomo Chemical Co., Ltd. make) 3 weight section were dissolved in the methylene chloride, and the solution whose solid content concentration is 18 % of the weight was prepared. The solution was cast on the glass plate and it dried for 20 minutes at 40 degrees C. The formed film (thickness: 100 micrometers) was exfoliated from the glass plate. To the produced cellulose triacetate film, it is 2 20kg/mm for 10 minutes at 145 degrees C. Stress was applied. Thus, the retardation within a field (Re) produced the optical optically biaxial transpance base material whose retardation (Rth) of 20nm and the thickness direction is 80nm.

[0129] (Production of an optical compensation sheet) It is coating liquid of an optical anisotropy layer used in the example 1 on an optical optically biaxial transpance base material 3 ml/m² It applied and dried at the room temperature. It heats for 1 minute at 130 degrees C, and orientation of the discotheque liquid crystallinity molecule was carried out, ultraviolet rays were irradiated, the polymerization of the discotheque liquid crystallinity molecule was carried out, and the orientation condition was fixed. The angular dependence of the retardation of an optical anisotropy layer was measured by the ellipsometer (Jasco Corp. make). Consequently, the average tilt angle of a discotheque liquid crystallinity molecule was 0.1 degrees. The retardation (Rth) of 20nm and the thickness direction of the retardation within a field of the produced whole optical compensation sheet (Re) was 140nm.

[0130] (Production of a elliptically-polarized-light plate) To the transpance base material side of an optical compensation sheet, the laminating of the polarization film and the transpance protective coat was carried out to this order, and the elliptically-polarized-light plate was produced. The lagging axis of a transpance base material and the polarization shaft of the polarization film have been arranged so that it may become parallel.

[0131] (Production of a liquid crystal display) The elliptically-polarized-light plate was deleted from commercial VA liquid crystal display (LCD5000), and the elliptically-polarized-light plate produced instead was stuck. When the contrast data of an omnidirection were measured about produced VA liquid crystal display, the angle of visibility from which a contrast ratio 20:1 is obtained was 160 degrees of four directions.

[0132] [Example 3]

(Production of an optical optically biaxial transpance base material) The cellulose triacetate 85 weight section, the triphenyl phosphate 10 weight section, and the ultraviolet ray absorbent (TM165, Sumitomo Chemical Co., Ltd. make) 5 weight section were dissolved in the methylene chloride, and the solution whose solid content concentration is 18 % of the weight was prepared. The solution was cast on the glass plate and it dried for 20 minutes at 40 degrees C. The formed film (thickness: 100 micrometers) was exfoliated from the glass plate. To the produced cellulose triacetate film, it is 2 20kg/mm for 10 minutes at 145 degrees C. Stress was applied. Thus, the retardation within a field (Re) produced the optical optically biaxial transpance base material whose retardation (Rth) of 50nm and the thickness direction is 120nm.

[0133] (Production of an optical compensation sheet) It is coating liquid of an optical anisotropy layer used in the example 1 on an optical optically biaxial transpance base material 6 ml/m² It applied and

dried at the room temperature. It heats for 1 minute at 130 degrees C, and orientation of the discotheque liquid crystallinity molecule was carried out, ultraviolet rays were irradiated, the polymerization of the discotheque liquid crystallinity molecule was carried out, and the orientation condition was fixed. The angular dependence of the retardation of an optical anisotropy layer was measured by the ellipsometer (Jasco Corp. make). Consequently, the average tilt angle of a discotheque liquid crystallinity molecule was 0.5 degrees. The retardation (Rth) of 50nm and the thickness direction of the retardation within a field of the produced whole optical compensation sheet (Re) was 250nm.

[0134] (Production of a elliptically-polarized-light plate) To the transporence base material side of an optical compensation sheet, the laminating of the polarization film and the transporence protective coat was carried out to this order, and the elliptically-polarized-light plate was produced. The lagging axis of a transporence base material and the polarization shaft of the polarization film have been arranged so that it may become parallel.

[0135] (Production of a liquid crystal display) The elliptically-polarized-light plate was deleted from commercial VA liquid crystal display (LCD5000), and the elliptically-polarized-light plate produced instead was stuck. When the contrast data of an omnidirection were measured about produced VA liquid crystal display, the angle of visibility from which a contrast ratio 20:1 is obtained was 160 degrees of four directions.

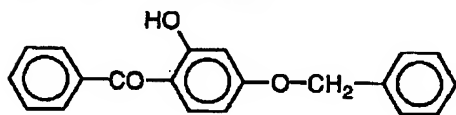
[0136] [Example 4]

(Production of an optical optically biaxial transporence base material) 60.9% of cellulose acetate 45 weight section, the following retardation rise agent 2.35 weight section, the triphenyl phosphate 2.75 weight section, and the phosphoric-acid biphenyl diphenyl 2.20 weight section were dissolved in the methylene chloride 232.75 weight section, the methanol 42.57 weight section, and the n-butanol 8.50 weight section whenever [average acetylation]. The obtained solution was cast using the drum flow casting machine, and the cellulose acetate film whose thickness after desiccation is 105 micrometers was produced.

[0137]

[Formula 35]

レターデーション上昇剤



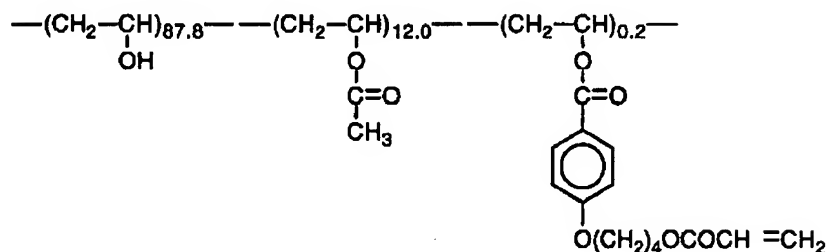
[0138] The cellulose acetate film was extended at 20% of real draw magnification, and the optical optically biaxial transporence base material was produced. The retardation of the transporence base material in the wavelength of 633nm was measured by the ellipsometer (M150, Jasco Corp. make). Consequently, 85nm and the retardation within a field (Re) of the retardation (Rth) of the thickness direction were 40nm.

[0139] (Production of an optical compensation sheet) Gelatin was applied to one field of a transporence base material, and the under coat was formed in it. On the under coat, the 2 % of the weight of the following denaturation polyvinyl alcohol and the water solution of 0.1 % of the weight of glutaraldehydes were applied, it dried, and the orientation film with a thickness of 0.5 micrometers was formed.

[0140]

[Formula 36]

変性ポリビニルアルコール



[0141] The discotheque liquid crystallinity molecule (1) 90 weight section used in the example 1, the ethyleneoxide denaturation trimethylolpropane triacrylate (V#360, product made from Osaka Organic chemistry) 10 weight section, melamine formaldehyde / acrylic-acid copolymer (Aldrich reagent) 0.6 weight section, the photopolymerization initiator (IRGACURE 907, Ciba-Geigy Japan make) 3.0 weight section, and the photosensitizer (kaya KYUA DETX, Nippon Kayaku Co., Ltd. make) 1.0 weight section were dissolved in the methyl-ethyl-ketone 170 weight section, and coating liquid was prepared. Coating liquid was applied on the orientation film and it dried. It heated for 1 minute at 130 degrees C, and orientation of the discotheque liquid crystallinity molecule was carried out. Furthermore ultraviolet rays were irradiated, the polymerization of the discotheque liquid crystallinity molecule was carried out, and the orientation condition was fixed. The thickness of the formed optical anisotropy layer was 1.2 micrometers. The retardation of the whole optical compensation sheet in the wavelength of 633nm was measured by the ellipsometer (M150, Jasco Corp. make). Consequently, the retardation (R_{th}) of 40m and the thickness direction of the retardation within a field (R_e) was 160nm.

[0142] (Production of a elliptically-polarized-light plate) To the transprence base material side of an optical compensation sheet, the laminating of the polarization film and the transprence protective coat was carried out to this order, and the elliptically-polarized-light plate was produced. The lagging axis of a transprence base material and the polarization shaft of the polarization film have been arranged so that it may become parallel.

[0143] (Production of a liquid crystal display) The polarizing plate was deleted from the commercial MVA liquid crystal display (VL-1530S, FUJITSU, LTD. make), and the elliptically-polarized-light plate produced instead was stuck. The angle of visibility from which a contrast ratio 10:1 is obtained without image reversal about the produced MVA liquid crystal display was measured. A result is shown in the 1st table.

[0144] [Example 5]

(Production of an optical optically biaxial transparence base material) The norbornene resin (ARTON, product made from JSR) 30 weight section was dissolved in the methylene chloride 70 weight section. The obtained solution was cast using the band casting machine, and the norbornene film whose thickness after desiccation is 100 micrometers was produced. The norbornene film was extended at 15% of real draw magnification to the longitudinal direction, it extended at 7% of real draw magnification crosswise further, and the optical optically biaxial transparence base material was produced. The retardation of the transparence base material in the wavelength of 633nm was measured by the ellipsometer (M150, Jasco Corp. make). Consequently, 45nm and the retardation within a field (Re) of the retardation (Rth) of the thickness direction were 40nm.

[0145] (Production of an optical compensation sheet) Corona discharge treatment of one field of a transperence base material was carried out. On the field which carried out corona discharge treatment, 2 % of the weight of denaturation polyvinyl alcohol used in the example 4 and the water solution of 0.1 % of the weight of glutaraldehydes were applied, it dried, and the orientation film with a thickness of 0.5 micrometers was formed. The discotheque liquid crystallinity molecule (1) 90 weight section used in the example 1, the ethyleneoxide denaturation trimethylolpropane triacrylate (V#360, product made from Osaka Organic chemistry) 10 weight section, melamine formaldehyde / acrylic-acid copolymer (Aldrich reagent) 0.6 weight section, the photopolymerization initiator (IRGACURE 907, Ciba-Geigy Japan

make) 3.0 weight section, and the photosensitizer (kaya KYUA DETX, Nippon Kayaku Co., Ltd. make) 1.0 weight section were dissolved in the methyl-ethyl-ketone 170 weight section, and coating liquid was prepared. Coating liquid was applied on the orientation film and it dried. It heated for 1 minute at 130 degrees C, and orientation of the discotheque liquid crystallinity molecule was carried out. Furthermore ultraviolet rays were irradiated, the polymerization of the discotheque liquid crystallinity molecule was carried out, and the orientation condition was fixed. The thickness of the formed optical anisotropy layer was 1.4 micrometers. The retardation of the whole optical compensation sheet in the wavelength of 633nm was measured by the ellipsometer (M150, Jasco Corp. make). Consequently, the retardation (Rth) of 30m and the thickness direction of the retardation within a field (Re) was 120nm.

[0146] (Production of a elliptically-polarized-light plate) To the transpance base material side of an optical compensation sheet, the laminating of the polarization film and the transpance protective coat was carried out to this order, and the elliptically-polarized-light plate was produced. The lagging axis of a transpance base material and the polarization shaft of the polarization film have been arranged so that it may become parallel.

[0147] (Production of a liquid crystal display) The polarizing plate was deleted from the commercial MVA liquid crystal display (VL-1530S, FUJITSU, LTD. make), and the elliptically-polarized-light plate produced instead was stuck. The angle of visibility from which a contrast ratio 10:1 is obtained without image reversal about the produced MVA liquid crystal display was measured. A result is shown in the 1st table.

[0148] [Example 6]

(Production of an optical optically biaxial transpance base material) The commercial polycarbonate film (Teijin, Ltd. make) was extended at 40% of real draw magnification to the longitudinal direction, it extended at 15% of real draw magnification crosswise further, and the optical optically biaxial transpance base material was produced. The retardation of the transpance base material in the wavelength of 633nm was measured by the ellipsometer (M150, Jasco Corp. make). Consequently, 100nm and the retardation within a field (Re) of the retardation (Rth) of the thickness direction were 200nm.

[0149] (Production of an optical compensation sheet) Corona discharge treatment of one field of a transpance base material was carried out. On the field which carried out corona discharge treatment, 2 % of the weight of denaturation polyvinyl alcohol used in the example 4 and the water solution of 0.1 % of the weight of glutaraldehydes were applied, it dried, and the orientation film with a thickness of 0.5 micrometers was formed. The discotheque liquid crystallinity molecule (1) 90 weight section used in the example 1, the ethyleneoxide denaturation trimethylolpropane triacrylate (V#360, product made from Osaka Organic chemistry) 10 weight section, melamine formaldehyde / acrylic-acid copolymer (Aldrich reagent) 0.6 weight section, the photopolymerization initiator (IRGACURE 907, Ciba-Geigy Japan make) 3.0 weight section, and the photosensitizer (kaya KYUA DETX, Nippon Kayaku Co., Ltd. make) 1.0 weight section were dissolved in the methyl-ethyl-ketone 170 weight section, and coating liquid was prepared. Coating liquid was applied on the orientation film and it dried. It heated for 1 minute at 130 degrees C, and orientation of the discotheque liquid crystallinity molecule was carried out. Furthermore ultraviolet rays were irradiated, the polymerization of the discotheque liquid crystallinity molecule was carried out, and the orientation condition was fixed. The thickness of the formed optical anisotropy layer was 3.5 micrometers. The retardation of the whole optical compensation sheet in the wavelength of 633nm was measured by the ellipsometer (M150, Jasco Corp. make). Consequently, the retardation (Rth) of 200m and the thickness direction of the retardation within a field (Re) was 300nm.

[0150] (Production of a elliptically-polarized-light plate) To the transpance base material side of an optical compensation sheet, the laminating of the polarization film and the transpance protective coat was carried out to this order, and the elliptically-polarized-light plate was produced. The lagging axis of a transpance base material and the polarization shaft of the polarization film have been arranged so that it may become parallel.

[0151] (Production of a liquid crystal display) The polarizing plate was deleted from the commercial MVA liquid crystal display (VL-1530S, FUJITSU, LTD. make), and the elliptically-polarized-light plate

produced instead was stuck. The angle of visibility from which a contrast ratio 10:1 is obtained without image reversal about the produced MVA liquid crystal display was measured. A result is shown in the 1st table.

[0152] [The example 1 of a comparison]

(Production of an optical-isotropy transparence base material) The commercial cellulose triacetate film (Fuji Photo Film Co., Ltd. make) was used as a transparence base material. The retardation of the transparence base material in the wavelength of 633nm was measured by the ellipsometer (M150, Jasco Corp. make). Consequently, 40nm and the retardation within a field (Re) were 3nm, and the retardation (Rth) of the thickness direction was the optical isotropy substantially.

[0153] (Production of an optical compensation sheet) Gelatin was applied to one field of a transparence base material, and the under coat was formed in it. On the under coat, 2 % of the weight of denaturation polyvinyl alcohol used in the example 4 and the water solution of 0.1 % of the weight of glutaraldehydes were applied, it dried, and the orientation film with a thickness of 0.5 micrometers was formed. The disothèque liquid crystallinity molecule (1) 90 weight section used in the example 1, the ethyleneoxide denaturation trimethylolpropane triacrylate (V#360, product made from Osaka Organic chemistry) 10 weight section, melamine formaldehyde / acrylic-acid copolymer (Aldrich reagent) 0.6 weight section, the photopolymerization initiator (IRGACURE 907, Ciba-Geigy Japan make) 3.0 weight section, and the photosensitizer (kaya KYUA DETX, Nippon Kayaku Co., Ltd. make) 1.0 weight section were dissolved in the methyl-ethyl-ketone 170 weight section, and coating liquid was prepared. Coating liquid was applied on the orientation film and it dried. It heated for 1 minute at 130 degrees C, and orientation of the disothèque liquid crystallinity molecule was carried out. Furthermore ultraviolet rays were irradiated, the polymerization of the disothèque liquid crystallinity molecule was carried out, and the orientation condition was fixed. The thickness of the formed optical anisotropy layer was 2.0 micrometers. The retardation of the whole optical compensation sheet in the wavelength of 633nm was measured by the ellipsometer (M150, Jasco Corp. make). Consequently, the retardation (Rth) of 3m and the thickness direction of the retardation within a field (Re) was 240nm.

[0154] (Production of a elliptically-polarized-light plate) To the transparence base material side of an optical compensation sheet, the laminating of the polarization film and the transparence protective coat was carried out to this order, and the elliptically-polarized-light plate was produced. The lagging axis of a transparence base material and the polarization shaft of the polarization film have been arranged so that it may become parallel.

[0155] (Production of a liquid crystal display) The polarizing plate was deleted from the commercial MVA liquid crystal display (VL-1530S, FUJITSU, LTD. make), and the elliptically-polarized-light plate produced instead was stuck. The angle of visibility from which a contrast ratio 10:1 is obtained without image reversal about the produced MVA liquid crystal display was measured. A result is shown in the 1st table.

[0156] The angle of visibility from which a contrast ratio 10:1 is obtained without image reversal about the MVA liquid crystal display (VL-1530S, FUJITSU, LTD. make) of the [example 1 of reference] marketing was measured. A result is shown in the 1st table.

[0157]

[Table 1]

The 1st table ----- MVA liquid crystal The retardation of an optical compensation sheet An angle of visibility A display Re Rth Four directions Slanting four directions -----
----- An example 4 40nm 160nm 80 degrees The 80-degree example 5 30nm 120nm 80-degree 75" example 6 200nm 300nm 80 degrees Example 1 of 60-degree comparison 3nm 240nm 80 degrees Example 1 of 55-degree reference With no optical compensation sheet 80degree 45" -

[Translation done.]

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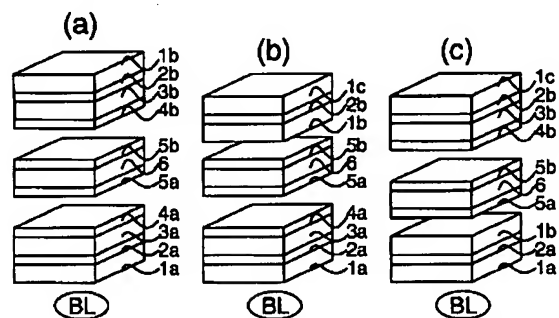
弁理士 柳川 泰男

(54) 【発明の名称】 光学補償シート、楕円偏光板および液晶表示装置

(57) 【要約】

【課題】 実質的に垂直に配向している棒状液晶性分子が多い液晶セルを正確に光学的に補償する。

【解決手段】 光学的一軸性または光学的二軸性を有する透明支持体と、ディスコティック液晶性分子の円盤面と透明支持体面との間の平均傾斜角が5°未満の状態ではディスコティック液晶性分子が配向している光学異方性層とを組み合わせ、光学補償シートとして使用する。



【特許請求の範囲】

【請求項1】 透明支持体およびディスコティック液晶性分子から形成された光学異方性層を有する光学補償シートであって、透明支持体が光学的一軸性または光学的二軸性を有し、ディスコティック液晶性分子の円盤面と透明支持体面との間の平均傾斜角が 5° 未満の状態ディスコティック液晶性分子が配向していることを特徴とする光学補償シート。

【請求項2】 透明支持体が、10乃至1000nmの範囲に、下記式で定義される面内レターデーション(Re)を有する請求項1に記載の光学補償シート。

$$Re = (n_x - n_y) \times d$$

【式中、 n_x および n_y は、透明支持体の面内屈折率であり、そして d は、透明支持体の厚さである】。

【請求項3】 透明支持体が、10乃至1000nmの範囲に、下記式で定義される厚み方向のレターデーション(Rth)を有する請求項1に記載の光学補償シート。

$$Rth = [\{ (n_x + n_y) / 2 \} - n_z] \times d$$

【式中、 n_x および n_y は、透明支持体の面内屈折率であり、 n_z は、の厚み方向の屈折率であり、そして d は、透明支持体の厚さである】。

【請求項4】 光学補償シートが、20乃至200nmの範囲に、下記式で定義される面内レターデーション(Re)を有する請求項1に記載の光学補償シート。

$$Re = (n_x - n_y) \times d$$

【式中、 n_x および n_y は、光学補償シートの面内屈折率であり、そして d は、光学補償シートの厚さである】。

【請求項5】 光学補償シートが、70乃至500nmの範囲に、下記式で定義される厚み方向のレターデーション(Rth)を有する請求項1に記載の光学補償シート。

$$Rth = [\{ (n_x + n_y) / 2 \} - n_z] \times d$$

【式中、 n_x および n_y は、光学補償シートの面内屈折率であり、 n_z は、光学補償シートの厚み方向の屈折率であり、そして d は、光学補償シートの厚さである】。

【請求項6】 透明支持体、ディスコティック液晶性分子から形成された光学異方性層、偏光膜および透明保護膜を有する楕円偏光板であって、透明支持体が光学的一軸性または光学的二軸性を有し、ディスコティック液晶性分子の円盤面と透明支持体面との間の平均傾斜角が 5° 未満の状態ディスコティック液晶性分子が配向していることを特徴とする楕円偏光板。

【請求項7】 VAモードの液晶セルおよびその両側に配置された二枚の偏光素子からなる液晶表示装置であって、偏光素子の少なくとも一方が、透明支持体、ディスコティック液晶性分子から形成された光学異方性層、偏光膜および透明保護膜を有する楕円偏光板であり、透明支持体が光学的一軸性または光学的二軸性を有し、そしてディスコティック液晶性分子の円盤面と透明支持体面

との間の平均傾斜角が 5° 未満の状態ディスコティック液晶性分子が配向していることを特徴とする液晶表示装置。

【発明の詳細な説明】

【0001】

【産業上の利用分野】本発明は、液晶性分子から形成された光学異方性層を有する光学補償シート、およびそれを用いた楕円偏光板と液晶表示装置とに関する。

【0002】

【従来の技術】液晶表示装置は、液晶セル、偏光素子および光学補償シート(位相差板)からなる。透過型液晶表示装置では、二枚の偏光素子を液晶セルの両側に取り付け、一枚または二枚の光学補償シートを液晶セルと偏光素子との間に配置する。反射型液晶表示装置では、反射板、液晶セル、一枚の光学補償シート、そして一枚の偏光素子の順に配置する。液晶セルは、棒状液晶性分子、それを封入するための二枚の基板および棒状液晶性分子に電圧を加えるための電極層からなる。液晶セルは、棒状液晶性分子の配向状態の違いで、透過型については、TN(Twisted Nematic)、IPS(In-Plane Switching)、FLC(Ferroelectric Liquid Crystal)、OCB(Optically Compensatory Bend)、STN(Supper Twisted Nematic)、VA(Vertically Aligned)、ECB(Electrically Controlled Birefringence)、反射型については、TN、HAN(Hybrid Aligned Nematic)、GH(Guest-Host)のような様々な表示モードが提案されている。

【0003】光学補償シートは、画像着色を解消したり、視野角を拡大するために、様々な液晶表示装置で用いられている。光学補償シートとしては、延伸複屈折ポリマーフィルムが従来から使用されていた。延伸複屈折フィルムからなる光学補償シートに代えて、透明支持体上にディスコティック液晶性分子から形成された光学異方性層を有する光学補償シートを使用することが提案されている。ディスコティック液晶性分子には多様な配向形態があるため、ディスコティック液晶性分子を用いることで、従来の延伸複屈折ポリマーフィルムでは得ることができない光学的性質を実現することが可能になった。

【0004】光学補償シートの光学的性質は、液晶セルの光学的性質、具体的には上記のような表示モードの違いに応じて決定する。ディスコティック液晶性分子を用いると、液晶セルの様々な表示モードに対応する様々な光学的性質を有する光学補償シートを製造することができる。ディスコティック液晶性分子を用いた光学補償シートでは、様々な表示モードに対応するものが既に提案されている。例えば、TNモードの液晶セル用光学補償シートは、特開平6-214116号公報、米国特許5583679号、同5646703号、ドイツ特許公報3911620A1号の各明細書に記載がある。また、

I PSモードまたはF LCモードの液晶セル用光学補償シートは、特開平10-54982号公報に記載がある。さらに、OCBモードまたはHANモードの液晶セル用光学補償シートは、米国特許5805253号および国際特許出願WO96/37804号の各明細書に記載がある。さらにまた、STNモードの液晶セル用光学補償シートは、特開平9-26572号公報に記載がある。そして、VAモードの液晶セル用光学補償シートは、特許番号第2866372号公報に記載がある。

【0005】

【発明が解決しようとする課題】従来の延伸複屈折ポリマーフィルムに代えて、ディスコティック液晶性分子を用いることで、従来よりも正確に液晶セルを光学的に補償することが可能になった。例えば、実質的に垂直に配向している棒状液晶性分子が多い液晶セル（VAモード、OCBモード、HANモード）に対しては、ディスコティック液晶性分子の円盤面と透明支持体面との間の平均傾斜角が5°未満の状態ではディスコティック液晶性分子を配向させると、有効に光学的に補償することができる。しかし、本発明者の研究によれば、ディスコティック液晶性分子を用いても、液晶セルを問題なく完全に光学的に補償することは非常に難しい。本発明の目的は、実質的に垂直に配向している棒状液晶性分子が多い液晶セルを正確に光学的に補償することができる光学補償シートを提供することである。

【0006】

【課題を解決するための手段】本発明の目的は、下記（1）～（5）の光学補償シート、下記（6）の楕円偏光板、および下記（7）の液晶表示装置により達成された。

（1）透明支持体およびディスコティック液晶性分子から形成された光学異方性層を有する光学補償シートであって、透明支持体が光学的一軸性または光学的二軸性を有し、ディスコティック液晶性分子の円盤面と透明支持体面との間の平均傾斜角が5°未満の状態ではディスコティック液晶性分子が配向していることを特徴とする光学補償シート。

【0007】（2）透明支持体が、10乃至1000nmの範囲に、下記式で定義される面内レターデーション（Re）を有する（1）に記載の光学補償シート。

$$Re = (n_x - n_y) \times d$$

式中、 n_x および n_y は、透明支持体の面内屈折率であり、そして d は、透明支持体の厚さである。

（3）透明支持体が、10乃至1000nmの範囲に、下記式で定義される厚み方向のレターデーション（Rth）を有する（1）に記載の光学補償シート。

$$Rth = [\{ (n_x + n_y) / 2 \} - n_z] \times d$$

式中、 n_x および n_y は、透明支持体の面内屈折率であり、 n_z は、透明支持体の厚み方向の屈折率であり、そして d は透明支持体の厚さである。

（4）光学補償シートが、20乃至200nmの範囲に、下記式で定義される面内レターデーション（Re）を有する（1）に記載の光学補償シート。

$$Re = (n_x - n_y) \times d$$

式中、 n_x および n_y は、光学補償シートの面内屈折率であり、そして d は、光学補償シートの厚さである。

（5）光学補償シートが、70乃至500nmの範囲に、下記式で定義される厚み方向のレターデーション（Rth）を有する（1）に記載の光学補償シート。

$$Rth = [\{ (n_x + n_y) / 2 \} - n_z] \times d$$

式中、 n_x および n_y は、光学補償シートの面内屈折率であり、 n_z は、光学補償シートの厚み方向の屈折率であり、そして d は、光学補償シートの厚さである。

【0008】（6）透明支持体、ディスコティック液晶性分子から形成された光学異方性層、偏光膜および透明保護膜を有する楕円偏光板であって、透明支持体が光学的一軸性または光学的二軸性を有し、ディスコティック液晶性分子の円盤面と透明支持体面との間の平均傾斜角が5°未満の状態ではディスコティック液晶性分子が配向していることを特徴とする楕円偏光板。

（7）VAモードの液晶セルおよびその両側に配置された二枚の偏光素子からなる液晶表示装置であって、偏光素子の少なくとも一方が、透明支持体、ディスコティック液晶性分子から形成された光学異方性層、偏光膜および透明保護膜を有する楕円偏光板であり、透明支持体が光学的一軸性または光学的二軸性を有し、そしてディスコティック液晶性分子の円盤面と透明支持体面との間の平均傾斜角が5°未満の状態ではディスコティック液晶性分子が配向していることを特徴とする液晶表示装置。

【0009】

【発明の効果】本発明者は研究の結果、光学的一軸性または光学的二軸性を有する透明支持体と、ディスコティック液晶性分子の円盤面と透明支持体面との間の平均傾斜角が5°未満の状態ではディスコティック液晶性分子が配向している光学異方性層とを併用することにより、実質的に垂直に配向している棒状液晶性分子が多い液晶セルを正確に光学的に補償することに成功した。従来の技術では、ディスコティック液晶性分子の光学的異方性のみで、実質的に垂直に配向している棒状液晶性分子が多い液晶セルを光学的に補償しようとしていた。ディスコティック液晶性分子には多様な配向形態があるが、ディスコティック液晶性分子のみでは液晶セルの光学的補償にも限度がある。本発明では、平均傾斜角が5°未満の状態では配向しているディスコティック液晶性分子の光学的異方性に加えて、光学的一軸性または光学的二軸性を有する透明支持体の光学的異方性を利用することで、実質的に垂直に配向している棒状液晶性分子が多い液晶セルの光学的性質に正確に対応（光学的に補償）することができる。また、液晶セルに加えて偏光膜も視角特性を有している。本発明者の研究によれば、偏光膜の視角補

償に、光学的一軸性または光学的二軸性（好ましくは光学的二軸性）を有する透明支持体の使用が有効である。

【0010】

【発明の実施の形態】図1は、透過型液晶表示装置の基本的な構成を示す模式図である。図1の(a)に示す透過型液晶表示装置は、バックライト(BL)側から順に、透明保護膜(1a)、偏光膜(2a)、透明支持体(3a)、光学異方性層(4a)、液晶セルの下基板(5a)、棒状液晶性分子(6)、液晶セルの上基板(5b)、光学異方性層(4b)、透明支持体(3b)、偏光膜(2b)、そして透明保護膜(1b)からなる。透明支持体および光学異方性層(3a~4aおよび4b~3b)が光学補償シートを構成する。そして、透明保護膜、偏光膜、透明支持体および光学異方性層(1a~4aおよび4b~1b)が楕円偏光板を構成する。図1の(b)に示す透過型液晶表示装置は、バックライト(BL)側から順に、透明保護膜(1a)、偏光膜(2a)、透明支持体(3a)、光学異方性層(4a)、液晶セルの下基板(5a)、棒状液晶性分子(6)、液晶セルの上基板(5b)、透明保護膜(1b)、偏光膜(2b)、そして透明保護膜(1c)からなる。透明支持体および光学異方性層(3a~4a)が光学補償シートを構成する。そして、透明保護膜、偏光膜、透明支持体および光学異方性層(1a~4a)が楕円偏光板を構成する。

【0011】図1の(c)に示す透過型液晶表示装置は、バックライト(BL)側から順に、透明保護膜(1a)、偏光膜(2a)、透明保護膜(1b)、液晶セルの下基板(5a)、棒状液晶性分子(6)、液晶セルの上基板(5b)、光学異方性層(4b)、透明支持体(3b)、偏光膜(2b)、そして透明保護膜(1c)からなる。透明支持体および光学異方性層(4b~3b)が光学補償シートを構成する。そして、透明保護膜、偏光膜、透明支持体および光学異方性層(4b~1c)が楕円偏光板を構成する。図2は、反射型液晶表示装置の基本的な構成を示す模式図である。図2に示す反射型液晶表示装置は、下から順に、液晶セルの下基板(5a)、反射板(RP)、棒状液晶性分子(6)、液晶セルの上基板(5b)、光学異方性層(4)、透明支持体(3)、偏光膜(2)、そして透明保護膜(1)からなる。透明支持体および光学異方性層(4~3)が光学補償シートを構成する。そして、透明保護膜、偏光膜、透明支持体および光学異方性層(4~1)が楕円偏光板を構成する。なお、図1~図2において、光学異方性層(4)と透明支持体(3)との配置の順序を逆にしてもよい。

【0012】[透明支持体]本発明では、光学的一軸性または光学的二軸性を有する透明支持体を用いる。支持体が透明であるとは、光透過率が80%以上であることを意味する。光学的一軸性支持体の場合、光学的に正

(光軸方向の屈折率が光軸に垂直な方向の屈折率よりも大)であっても負(光軸方向の屈折率が光軸に垂直な方向の屈折率よりも小)であってもよい。光学的二軸性支持体の場合、透明支持体の屈折率 n_x 、 n_y および n_z は、全て異なる値($n_x \neq n_y \neq n_z$)になる。光学的一軸性または光学的二軸性を有する透明支持体の面内レターデーション(R_e)は、10乃至1000nmであることが好ましく、15乃至300nmであることがさらに好ましく、20乃至200nmであることが最も好ましい。光学的一軸性または光学的二軸性を有する透明支持体の厚み方向のレターデーション(R_{th})は、10乃至1000nmであることが好ましく、15乃至300nmであることがより好ましく、20乃至200nmであることがさらに好ましい。透明支持体の面内レターデーション(R_e)と厚み方向のレターデーション(R_{th})は、それぞれ下記式で定義される。

$$R_e = (n_x - n_y) \times d$$

$$R_{th} = \{ (n_x + n_y) / 2 - n_z \} \times d$$

式中、 n_x および n_y は、透明支持体の面内屈折率であり、 n_z は透明支持体の厚み方向の屈折率であり、そして d は透明支持体の厚さである。

【0013】光学的異方性を有する透明支持体としては、一般に合成ポリマー（例、ポリカーボネート、ポリスルホン、ポリエーテルスルホン、ポリアクリレート、ポリメタクリレート、ノルボルネン樹脂）が用いられる。ただし、欧州特許0911656A2号明細書に記載されている(1)レターデーション上昇剤の使用、

(2)セルロースアセテートの酢化度の低下、あるいは(3)冷却溶解法によるフィルムの製造により、光学的異方性を有するセルロースエステルフィルムを製造することもできる。ポリマーフィルムからなる透明支持体は、ソルベントキャスト法により形成することが好ましい。

【0014】光学的一軸性または光学的二軸性を得るためには、ポリマーフィルムに延伸処理を実施することが好ましい。光学的一軸性支持体を製造する場合は、通常の一軸延伸処理または二軸延伸処理を実施すればよい。光学的二軸性支持体を製造する場合は、アンバランス二軸延伸処理を実施することが好ましい。アンバランス二軸延伸では、ポリマーフィルムをある方向に一定倍率（例えば3乃至100%、好ましくは5乃至30%）延伸し、それと垂直な方向にそれ以上の倍率（例えば6乃至200%、好ましくは10乃至90%）延伸する。二方向の延伸処理は、同時に実施してもよい。延伸方向（アンバランス二軸延伸では延伸倍率の高い方向）と延伸後のフィルムの面内の遅相軸とは、実質的に同じ方向になることが好ましい。延伸方向と遅相軸との角度は、10°未満であることが好ましく、5°未満であることがさらに好ましく、3°未満であることが最も好ましい。

【0015】光学的一軸性または光学的二軸性を有する透明支持体と、光学的等方性を有する透明支持体（例、セルロースアセテートフィルム）とを積層してもよい。透明支持体の厚さは、10乃至500 μm であることが好ましく、50乃至200 μm であることがさらに好ましい。透明支持体とその上に設けられる層（接着層、配向膜あるいは光学異方性層）との接着を改善するため、透明支持体に表面処理（例、グロー放電処理、コロナ放電処理、紫外線（UV）処理、火炎処理）を実施してもよい。透明支持体に紫外線吸収剤を添加してもよい。透明支持体の上に、接着層（下塗り層）を設けてもよい。接着層については、特開平7-333433号公報に記載がある。接着層の厚さは、0.1乃至2 μm であることが好ましく、0.2乃至1 μm であることがさらに好ましい。

【0016】〔配向膜〕配向膜は、有機化合物（好ましくはポリマー）のラビング処理、無機化合物の斜方蒸着、マイクログループを有する層の形成、あるいはラングミュア・プロジェクト法（LB膜）による有機化合物（例、 ω -トリコサン酸、ジオクタデシルメチルアンモニウムクロライド、ステアリン酸メチル）の累積のような手段で、設けることができる。さらに、電場の付与、磁場の付与あるいは光照射により、配向機能が生じる配向膜も知られている。ポリマーのラビング処理により形成する配向膜が特に好ましい。ラビング処理は、ポリマー層の表面を、紙や布で一定方向に、数回こすることにより実施する。ディスコティック液晶性分子を平均傾斜角が5°未満の状態に配向させるためには、配向膜の表面エネルギーを低下させないポリマー（通常の配向膜用ポリマー）を配向膜に用いることが好ましい。配向膜の厚さは、0.01乃至5 μm であることが好ましく、0.05乃至1 μm であることがさらに好ましい。なお、配向膜を用いて、光学異方性層のディスコティック液晶性分子を配向させてから、光学異方性層を透明支持体上に転写してもよい。配向状態で固定されたディスコティック液晶性分子は、配向膜がなくても配向状態を維持することができる。また、本発明ではディスコティック液晶性分子を平均傾斜角が5°未満の状態に配向させるため、ラビング処理をする必要はなく、場合によっては配向膜も不要である。ただし、液晶性分子と透明支持体との密着性を改善する目的で、界面で液晶性分子と化学結合を形成する配向膜（特開平9-152509号公報記載）を用いてもよい。密着性改善の目的で配向膜を使用する場合は、ラビング処理を実施しなくてもよい。

【0017】〔光学異方性層〕光学異方性層は、ディスコティック液晶性分子から形成する。ディスコティック液晶性分子は、ディスコティック液晶性分子の円盤面と透明支持体面との間の平均傾斜角が5°未満の状態に配

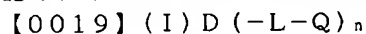
向させる。前述した光学的一軸性または光学的二軸性を有する透明支持体と、平均傾斜角が5°未満の状態に配向しているディスコティック液晶性分子とを組み合わせた結果として、光学補償シート全体の面内レターデーション（Re）は、20乃至200nmであることが好ましく、20乃至100nmであることがさらに好ましく、20乃至70nmであることが最も好ましい。光学補償シート全体の厚み方向のレターデーション（Rth）は、70乃至500nmであることが好ましく、70乃至300nmであることがより好ましく、70乃至200nmであることがさらに好ましい。光学補償シートの面内レターデーション（Re）と厚み方向のレターデーション（Rth）は、それぞれ下記式で定義される。

$$Re = (n_x - n_y) \times d$$

$$Rth = [\{ (n_x + n_y) / 2 \} - n_z] \times d$$

式中、 n_x および n_y は、光学補償シートの面内屈折率であり、 n_z は光学補償シートの厚み方向の屈折率であり、そして d は光学補償シートの厚さである。

【0018】ディスコティック液晶性分子は、配向している状態で固定されていることが好ましい。ポリマーバインダーを用いて配向状態を固定することもできるが、重合反応により固定することが好ましい。ディスコティック液晶性分子は、様々な文献（C. Destrad et al., Mol. Cryst. Liq. Cryst., vol. 71, page 111 (1981) ; 日本化学会編、季刊化学総説、No. 22、液晶の化学、第5章、第10章第2節(1994) ; B. Kohne et al., Angew. Chem. Soc. Chem. Comm., page 1794 (1985) ; J. Zhang et al., J. Am. Chem. Soc., vol. 116, page 2655 (1994)）に記載されている。ディスコティック液晶性分子の重合については、特開平8-27284公報に記載がある。ディスコティック液晶性分子を重合により固定するためには、ディスコティック液晶性分子の円盤状コアに、置換基として重合性基を結合させる必要がある。ただし、円盤状コアに重合性基を直結させると、重合反応において配向状態を保つことが困難になる。そこで、円盤状コアと重合性基との間に、連結基を導入する。従って、ディスコティック液晶性分子は、下記式（I）で表わされる化合物であることが好ましい。



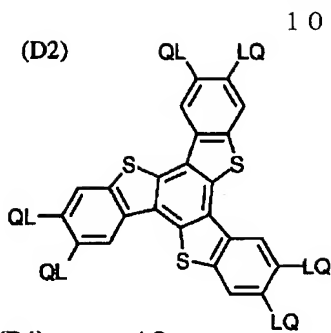
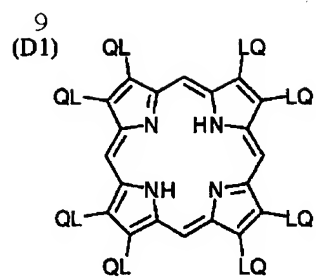
式中、Dは円盤状コアであり；Lは二価の連結基であり；Qは重合性基であり；そして、 n は4乃至12の整数である。上記式の円盤状コア（D）の例を以下に示す。以下の各例において、LQ（またはQL）は、二価の連結基（L）と重合性基（Q）との組み合わせを意味する。

【0020】

【化1】

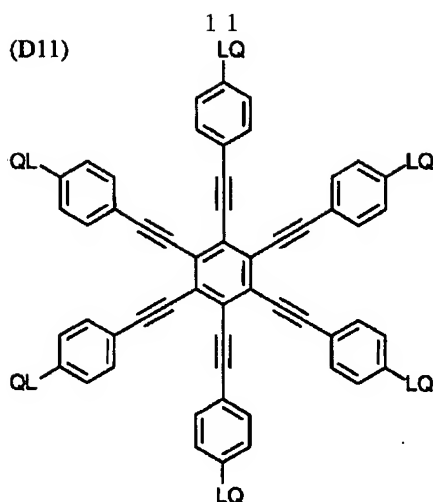
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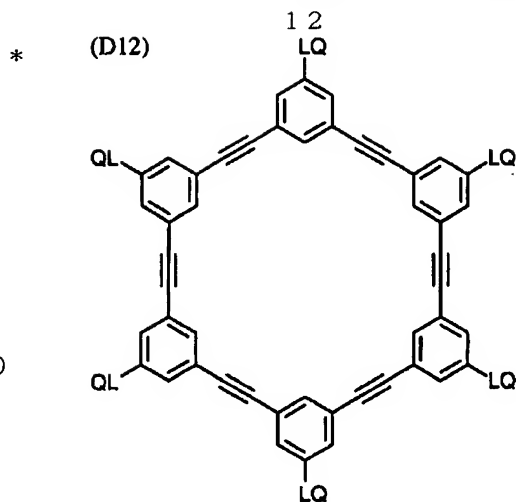
(7)

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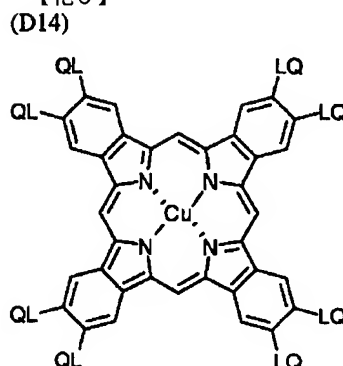
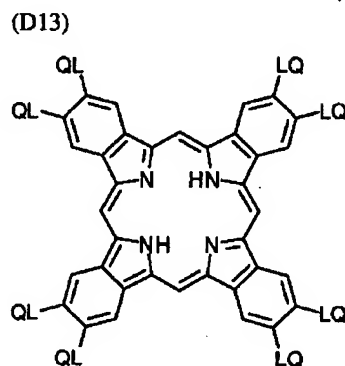
【0024】

【化5】



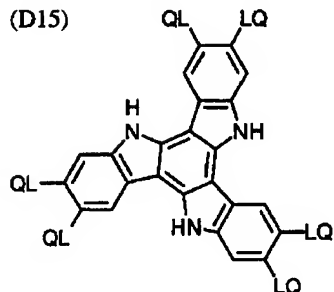
【0025】

【化6】



【0026】

【化7】



【0027】上記式において、二価の連結基(L)は、アルキレン基、アルケニレン基、アリーレン基、-CO-、-NH-、-O-、-S-およびそれらの組み合わせからなる群より選ばれる二価の連結基であることが好ましい。二価の連結基(L)は、アルキレン基、アルケニレン基、アリーレン基、-CO-、-NH-、-O-および-S-からなる群より選ばれる二価の基を少なくとも二つ組み合わせた基であることがさらに好ましい。二価の連結基(L)は、アルキレン基、アルケニレン基、アリーレン基、-CO-および-O-からなる群より選ばれる二価の基を少なくとも二つ組み合わせた基であることが最も好ましい。アルキレン基の炭素原子数 ※50

※は、1乃至12であることが好ましい。アルケニレン基の炭素原子数は、2乃至12であることが好ましい。アリーレン基の炭素原子数は、6乃至10であることが好ましい。アルキレン基、アルケニレン基およびアリーレン基は、置換基(例、アルキル基、ハロゲン原子、シアノ、アルコキシ基、アシルオキシ基)を有していてもよい。二価の連結基(L)の例を以下に示す。左側が円盤状コア(D)に結合し、右側が重合性基(Q)に結合する。ALはアルキレン基またはアルケニレン基を意味し、ARはアリーレン基を意味する。

【0028】L1:-AL-CO-O-AL-

L2:-AL-CO-O-AL-O-

L3:-AL-CO-O-AL-O-AL-

L4:-AL-CO-O-AL-O-CO-

L5:-CO-AR-O-AL-

L6:-CO-AR-O-AL-O-

L7:-CO-AR-O-AL-O-CO-

L8:-CO-NH-AL-

L9:-NH-AL-O-

L10:-NH-AL-O-CO-

L11:-O-AL-

L12:-O-AL-O-

L13:-O-AL-O-CO-

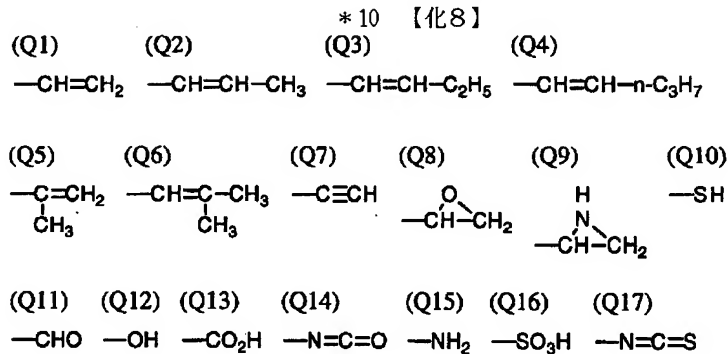
【0029】L14: $-O-AL-O-CO-NH-AL-$
 $-$
 L15: $-O-AL-S-AL-$
 L16: $-O-CO-AL-AR-O-AL-O-CO-$
 L17: $-O-CO-AR-O-AL-CO-$
 L18: $-O-CO-AR-O-AL-O-CO-$
 L19: $-O-CO-AR-O-AL-O-AL-O-C-$
 $O-$
 L20: $-O-CO-AR-O-AL-O-AL-O-A-$
 $L-O-CO-$

* L21: $-S-AL-$
 L22: $-S-AL-O-$
 L23: $-S-AL-O-CO-$
 L24: $-S-AL-S-AL-$
 L25: $-S-AR-AL-$

【0030】式(I)の重合性基(Q)は、重合反応の種類に応じて決定する。重合性基(Q)の例を以下に示す。

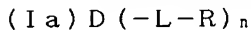
【0031】

【化8】



【0032】重合性基(Q)は、不飽和重合性基(Q1～Q7)、エポキシ基(Q8)またはアジリジニル基(Q9)であることが好ましく、不飽和重合性基であることがさらに好ましく、エチレン性不飽和重合性基(Q1～Q6)であることが最も好ましい。式(I)において、nは4乃至12の整数である。具体的な数字は、ディスコティックコア(D)の種類に応じて決定される。なお、複数のLとQの組み合わせは、異なってもよいが、同一であることが好ましい。

【0033】二種類以上のディスコティック液晶性分子を併用してもよい。例えば、以上述べたような重合性ディスコティック液晶性分子と非重合性ディスコティック液晶性分子とを併用することができる。非重合性ディスコティック液晶性分子は、前述した重合性ディスコティック液晶性分子の重合性基(Q)を、水素原子またはアルキル基に変更した化合物であることが好ましい。すなわち、非重合性ディスコティック液晶性分子は、下記式(Ia)で表わされる化合物であることが好ましい。



式中、Dは円盤状コアであり；Lは二価の連結基であり；Rは水素原子またはアルキル基であり；そして、nは4乃至12の整数である。式(Ia)の円盤状コア(D)の例は、LQ(またはQL)をLR(またはRL)に変更する以外は、前記の重合性ディスコティック液晶分子の例と同様である。また、二価の連結基(L)の例も、前記の重合性ディスコティック液晶分子の例と同様である。Rのアルキル基は、炭素原子数が1乃至40であることが好ましく、1乃至30であることがさらに好ましい。環状アルキル基よりも鎖状アルキル基の方

※が好ましく、分岐を有する鎖状アルキル基よりも直鎖状アルキル基の方が好ましい。Rは、水素原子または炭素原子数が1乃至30の直鎖状アルキル基であることが特に好ましい。

【0034】ディスコティック液晶性分子の円盤面と透明支持体面との平均傾斜角が5°未満の状態でディスコティック液晶性分子を配向させるためには、ディスコティック液晶性分子と相分離できる化合物を一定の範囲の量で使用することが好ましい。ディスコティック液晶性分子と相分離できる化合物には、セルロースの低級脂肪酸エステル、含フッ素界面活性剤および1, 3, 5-トリアジン環を有する化合物が含まれる。

【0035】セルロースの低級脂肪酸エステルにおける「低級脂肪酸」とは、炭素原子数が6以下の脂肪酸を意味する。炭素原子数は、2乃至5であることが好ましく、2乃至4であることがさらに好ましい。脂肪酸には置換基(例、ヒドロキシ)が結合していてもよい。二種類以上の脂肪酸がセルロースとエステルを形成していてもよい。セルロースの低級脂肪酸エステルの例には、セルロースアセテート、セルロースプロピオネート、セルロースブチレート、セルロースヒドロキシプロピオネート、セルロースアセテートプロピオネートおよびセルロースアセテートブチレートが含まれる。セルロースアセテートブチレートが特に好ましい。セルロースアセテートブチレートのブチリル化度は、30%以上であることが好ましく、30乃至80%であることがさらに好ましい。セルロースアセテートブチレートのアセチル化度は、30%以下であることが好ましく、1乃至30%であることがさらに好ましい。セルロースの低級脂肪酸エ

ステルは、ディスコティック液晶性分子の量の0.01乃至1重量%の量で使用することが好ましく、0.1乃至1重量%の量で使用することがさらに好ましく、0.3乃至0.9重量%の量で使用することが最も好ましい。セルロースの低級脂肪酸エステル塗布量は、1乃至500mg/m²の範囲であることが好ましく、3乃至300mg/m²の範囲であることがさらに好ましく、5乃至200mg/m²の範囲であることが最も好ましい。

【0036】含フッ素界面活性剤は、フッ素原子を含む疎水性基、ノニオン性、アニオン性、カチオン性あるいは両性の親水性基および任意に設けられる連結基からなる。一つの疎水性基と一つの親水性基からなる含フッ素界面活性剤は、下記式(II)で表わされる。

【0037】(II) $Rf-L^3-Hy$

式中、Rfは、フッ素原子で置換された一価の炭化水素残基であり；L³は、単結合または二価の連結基であり；そして、Hyは親水性基である。式(II)のRfは、疎水性基として機能する。炭化水素残基は、アルキル基またはアリール基であることが好ましい。アルキル基の炭素原子数は3乃至30であることが好ましく、アリール基の炭素原子数は6乃至30であることが好ましい。炭化水素残基に含まれる水素原子の一部または全部は、フッ素原子で置換されている。フッ素原子で、炭化水素残基に含まれる水素原子の50%以上を置換することが好ましく、60%以上を置換することがより好ましく、70%以上を置換することがさらに好ましく、80%以上を置換することが最も好ましい。残りの水素原子は、さらに他のハロゲン原子(例、塩素原子、臭素原子)で置換されていてもよい。Rfの例を以下に示す。

【0038】Rf1: $n-C_8F_{17}-$

Rf2: $n-C_8F_{13}-$

Rf3: $Cl-(CF_2-CFCl)_3-CF_2-$

Rf4: $H-(CF_2)_8-$

Rf5: $H-(CF_2)_{10}-$

Rf6: $n-C_9F_{19}-$

Rf7: ペンタフルオロフェニル

Rf8: $n-C_7F_{15}-$

Rf9: $Cl-(CF_2-CFCl)_2-CF_2-$

Rf10: $H-(CF_2)_4-$

Rf11: $H-(CF_2)_6-$

Rf12: $Cl-(CF_2)_6-$

Rf13: C_3F_7-

【0039】式(II)において、二価の連結基は、アルキレン基、アリーレン基、二価のヘテロ環残基、 $-CO-$ 、 $-NR-$ (Rは炭素原子数が1乃至5のアルキル基または水素原子)、 $-O-$ 、 $-SO_2-$ およびそれらの組み合わせからなる群より選ばれる二価の連結基であることが好ましい。式(II)のL³の例を以下に示す。左側が疎水性基(Rf)に結合し、右側が親水性基(H

y)に結合する。ALはアルキレン基、ARはアリーレン基、Hcは二価のヘテロ環残基を意味する。なお、アルキレン基、アリーレン基および二価のヘテロ環残基は、置換基(例、アルキル基)を有していてもよい。

【0040】L0: 単結合

L31: $-SO_2-NR-$

L32: $-AL-O-$

L33: $-CO-NR-$

L34: $-AR-O-$

L35: $-SO_2-NR-AL-CO-O-$

L36: $-CO-O-$

L37: $-SO_2-NR-AL-O-$

L38: $-SO_2-NR-AL-$

L39: $-CO-NR-AL-$

L40: $-AL^1-O-AL^2-$

L41: $-Hc-AL-$

L42: $-SO_2-NR-AL^1-O-AL^2-$

L43: $-AR-$

L44: $-O-AR-SO_2-NR-AL-$

L45: $-O-AR-SO_2-NR-$

L46: $-O-AR-O-$

【0041】式(II)のHyは、ノニオン性親水性基、アニオン性親水性基、カチオン性親水性基あるいはそれらの組み合わせ(両性親水性基)のいずれかである。ノニオン性親水性基が特に好ましい。式(II)のHyの例を以下に示す。

【0042】Hy1: $-(CH_2CH_2O)_n-H$ (nは5乃至30の整数)

Hy2: $-(CH_2CH_2O)_n-R^1$ (nは5乃至30の整数、R¹は炭素原子数が1乃至6のアルキル基)

Hy3: $-(CH_2CHOHCH_2)_n-H$ (nは5乃至30の整数)

Hy4: $-COOM$ (Mは水素原子、アルカリ金属原子または解離状態)

Hy5: $-SO_3M$ (Mは水素原子、アルカリ金属原子または解離状態)

Hy6: $-(CH_2CH_2O)_n-CH_2CH_2CH_2-SO_3M$ (nは5乃至30の整数、Mは水素原子またはアルカリ金属原子)

Hy7: $-OPO(OH)_2$

Hy8: $-N^+(CH_3)_3 \cdot X^-$ (Xはハロゲン原子)

Hy9: $-COONH_4$

【0043】ノニオン性親水性基(Hy1、Hy2、Hy3)が好ましく、ポリエチレンオキシドからなる親水性基(Hy1)が最も好ましい。式(II)で表わされる含フッ素界面活性剤の具体例を、以上のRf、L³およびHyの例を引用して示す。

【0044】FS-1: Rf1-L31(R=C₃H₇)
-Hy1(n=6)

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FS-2: Rf 1-L31 (R=C₃ H₇) -Hy 1 (n=11)
 FS-3: Rf 1-L31 (R=C₃ H₇) -Hy 1 (n=16)
 FS-4: Rf 1-L31 (R=C₃ H₇) -Hy 1 (n=21)
 FS-5: Rf 1-L31 (R=C₂ H₅) -Hy 1 (n=6)
 FS-6: Rf 1-L31 (R=C₂ H₅) -Hy 1 (n=11)
 FS-7: Rf 1-L31 (R=C₂ H₅) -Hy 1 (n=16)
 FS-8: Rf 1-L31 (R=C₂ H₇) -Hy 1 (n=21)
 FS-9: Rf 2-L31 (R=C₃ H₇) -Hy 1 (n=6)
 FS-10: Rf 2-L31 (R=C₃ H₇) -Hy 1 (n=11)
 FS-11: Rf 2-L31 (R=C₃ H₇) -Hy 1 (n=16)
 FS-12: Rf 2-L31 (R=C₃ H₇) -Hy 1 (n=21)
 FS-13: Rf 3-L32 (AL=CH₂) -Hy 1 (n=5)
 FS-14: Rf 3-L32 (AL=CH₂) -Hy 1 (n=10)
 FS-15: Rf 3-L32 (AL=CH₂) -Hy 1 (n=15)
 FS-16: Rf 3-L32 (AL=CH₂) -Hy 1 (n=20)
 FS-17: Rf 4-L33 (R=C₃ H₇) -Hy 1 (n=7)
 FS-18: Rf 4-L33 (R=C₃ H₇) -Hy 1 (n=13)
 FS-19: Rf 4-L33 (R=C₃ H₇) -Hy 1 (n=19)
 FS-20: Rf 4-L33 (R=C₃ H₇) -Hy 1 (n=25)
 【0045】FS-21: Rf 5-L32 (AL=CH₂) -Hy 1 (n=11)
 FS-22: Rf 5-L32 (AL=CH₂) -Hy 1 (n=15)
 FS-23: Rf 5-L32 (AL=CH₂) -Hy 1 (n=20)
 FS-24: Rf 5-L32 (AL=CH₂) -Hy 1 (n=30)
 FS-25: Rf 6-L34 (AR=p-フェニレン) -Hy 1 (n=11)
 FS-26: Rf 6-L34 (AR=p-フェニレン) -Hy 1 (n=17)

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FS-27: Rf 6-L34 (AR=p-フェニレン) -Hy 1 (n=23)
 FS-28: Rf 6-L34 (AR=p-フェニレン) -Hy 1 (n=29)
 FS-29: Rf 1-L35 (R=C₃ H₇, AL=CH₂) -Hy 1 (n=20)
 FS-30: Rf 1-L35 (R=C₃ H₇, AL=CH₂) -Hy 1 (n=30)
 FS-31: Rf 1-L35 (R=C₃ H₇, AL=CH₂) -Hy 1 (n=40)
 FS-32: Rf 1-L36-Hy 1 (n=5)
 FS-33: Rf 1-L36-Hy 1 (n=10)
 FS-34: Rf 1-L36-Hy 1 (n=15)
 FS-35: Rf 1-L36-Hy 1 (n=20)
 FS-36: Rf 7-L36-Hy 1 (n=8)
 FS-37: Rf 7-L36-Hy 1 (n=13)
 FS-38: Rf 7-L36-Hy 1 (n=18)
 FS-39: Rf 7-L36-Hy 1 (n=25)
 【0046】FS-40: Rf 1-L0-Hy 1 (n=6)
 FS-41: Rf 1-L0-Hy 1 (n=11)
 FS-42: Rf 1-L0-Hy 1 (n=16)
 FS-43: Rf 1-L0-Hy 1 (n=21)
 FS-44: Rf 1-L31 (R=C₃ H₇) -Hy 2 (n=7, R¹=C₂ H₅)
 FS-45: Rf 1-L31 (R=C₃ H₇) -Hy 2 (n=13, R¹=C₂ H₅)
 FS-46: Rf 1-L31 (R=C₃ H₇) -Hy 2 (n=20, R¹=C₂ H₅)
 FS-47: Rf 1-L31 (R=C₃ H₇) -Hy 2 (n=28, R¹=C₂ H₅)
 FS-48: Rf 8-L32 (AL=CH₂) -Hy 1 (n=5)
 FS-49: Rf 8-L32 (AL=CH₂) -Hy 1 (n=10)
 FS-50: Rf 8-L32 (AL=CH₂) -Hy 1 (n=15)
 FS-51: Rf 8-L32 (AL=CH₂) -Hy 1 (n=20)
 FS-52: Rf 1-L37 (R=C₃ H₇, AL=CH₂C H₂) -Hy 3 (n=5)
 FS-53: Rf 1-L37 (R=C₃ H₇, AL=CH₂C H₂) -Hy 3 (n=7)
 FS-54: Rf 1-L37 (R=C₃ H₇, AL=CH₂C H₂) -Hy 3 (n=9)
 FS-55: Rf 1-L37 (R=C₃ H₇, AL=CH₂C H₂) -Hy 3 (n=12)
 FS-56: Rf 9-L0-Hy 4 (M=H)
 FS-57: Rf 3-L0-Hy 4 (M=H)
 FS-58: Rf 1-L38 (R=C₃ H₇, AL=CH

2) -Hy 4 (M=K)

FS-59: Rf 4-L39 (R=C₃H₇, AL=CH

2) -Hy 4 (M=Na)

【0047】FS-60: Rf 1-L0-Hy 5 (M=K)

FS-61: Rf 10-L40 (AL¹=CH₂, AL²=CH₂C

H₂) -Hy 5 (M=Na)

FS-62: Rf 11-L40 (AL¹=CH₂, AL²=CH₂C

H₂) -Hy 5 (M=Na)

FS-63: Rf 5-L40 (AL¹=CH₂, AL²=CH₂C

H₂) -Hy 5 (M=Na)

FS-64: Rf 1-L38 (R=C₃H₇, AL=CH₂CH₂CH

2) -Hy 5 (M=Na)

FS-65: Rf 1-L31 (R=C₃H₇) -Hy 6 (n=5, M=Na)

FS-66: Rf 1-L31 (R=C₃H₇) -Hy 6 (n=10, M=Na)

FS-67: Rf 1-L31 (R=C₃H₇) -Hy 6 (n=15, M=Na)

FS-68: Rf 1-L31 (R=C₃H₇) -Hy 6 (n=20, M=Na)

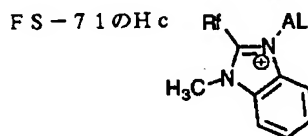
FS-69: Rf 1-L38 (R=C₂H₅, AL=CH₂CH₂) -Hy 7

FS-70: Rf 1-L38 (R=H, AL=CH₂CH₂CH₂) -Hy 8 (X=I)

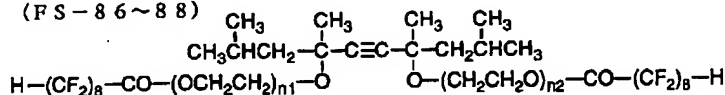
FS-71: Rf 11-L41 (下記Hc, AL=CH₂CH₂CH₂) -Hy 6 (Mは解離)

【0048】

【化9】



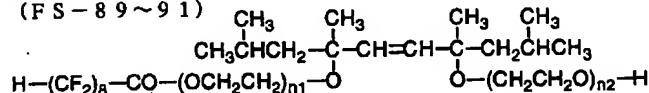
(FS-86~88)



【0052】FS-86: n1+n2=12, FS-87: n1+n2=18, FS-88: n1+n2=24

※40 【化11】

(FS-89~91)



【0054】FS-89: n1+n2=20, FS-90: n1+n2=30, FS-91: n1+n2=40

★ 【化12】

* 【0049】FS-72: Rf 1-L42 (R=C₃H₇, AL¹=CH₂C

H₂, AL²=CH₂CH₂CH₂) -Hy 6 (M=Na)

FS-73: Rf 12-L0-Hy 5 (M=Na)

FS-74: Rf 13-L43 (AR=o-フェニレン) -Hy 6 (M=K)

FS-75: Rf 13-L43 (AR=m-フェニレン) -Hy 6 (M=K)

FS-76: Rf 13-L43 (AR=p-フェニレン) -Hy 6 (M=K)

FS-77: Rf 6-L44 (R=C₂H₅, AL=CH₂CH₂) -Hy 5 (M=H)

FS-78: Rf 6-L45 (AR=p-フェニレン, R=C₂H₅) -Hy 1 (n=9)

FS-79: Rf 6-L45 (AR=p-フェニレン, R=C₂H₅) -Hy 1 (n=14)

FS-80: Rf 6-L45 (AR=p-フェニレン, R=C₂H₅) -Hy 1 (n=19)

FS-81: Rf 6-L45 (AR=p-フェニレン, R=C₂H₅) -Hy 1 (n=28)

FS-82: Rf 6-L46 (AR=p-フェニレン) -Hy 1 (n=5)

FS-83: Rf 6-L46 (AR=p-フェニレン) -Hy 1 (n=10)

FS-84: Rf 6-L46 (AR=p-フェニレン) -Hy 1 (n=15)

FS-85: Rf 6-L46 (AR=p-フェニレン) -Hy 1 (n=20)

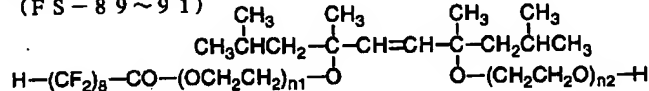
【0050】フッ素原子を含む疎水性基または親水性基を二以上有する含フッ素界面活性剤を用いてもよい。二以上の疎水性基または親水性基を有する含フッ素界面活性剤の例を以下に示す。

【0051】

【化10】

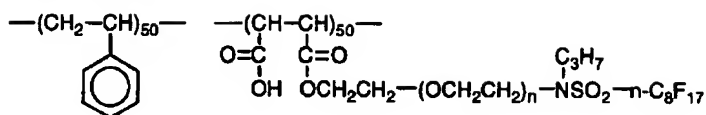
*

(FS-89~91)



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(FS-92~95)

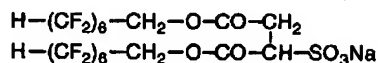
22



【0056】FS-92: n=5、FS-93: n=10、FS-94: n=15、FS-95: n=20

【0057】

【化13】
(FS-96)

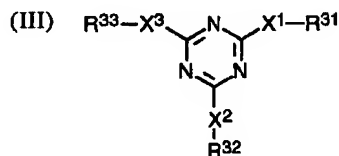


【0058】二種類以上の含フッ素界面活性剤を併用してもよい。界面活性剤については、様々な文献(例、堀口弘著「新界面活性剤」三共出版(1975)、M.J. Schick, Nonionic Surfactants, Marcell Dekker Inc., New York, (1967)、特開平7-13293号公報)に記載がある。含フッ素界面活性剤は、ディスコティック液晶性分子の量の2乃至30重量%の量で使用することが好ましく、3乃至25重量%の量で使用することがさらに好ましく、5乃至10重量%の量で使用すること最も好ましい。含フッ素界面活性剤の塗布量は、25乃至1000 mg/m² の範囲であることが好ましく、30乃至500 mg/m² の範囲であることがさらに好ましく、35乃至200 mg/m² の範囲であることが最も好ましい。

【0059】1, 3, 5-トリアジン環を有する化合物は、下記式(III)で表される化合物であることが好ましい。

【0060】

【化14】



【0061】式中、X¹、X² および X³ は、それぞれ独立に、単結合、-NR- (Rは炭素原子数が1乃至30のアルキル基または水素原子)、-O-または-S-であり；そして、R³¹、R³² および R³³ は、それぞれ独立に、アルキル基、アルケニル基、アリール基または複素環基である。式(III)で表される化合物は、メラミン化合物であることが特に好ましい。メラミン化合物では、式(III)において、X¹、X² または X³ が-NR-であるか、あるいは、X¹、X² または X³ が単結合であり、かつ R³¹、R³² および R³³ が窒素原子に遊離原子価をもつ複素環基である。メラミン化合物について

*は、式(IV)を引用して、さらに詳細に説明する。-NR-のRは、水素原子であることが特に好ましい。

R³¹、R³² および R³³ は、アリール基であることが特に好ましい。

【0062】上記アルキル基は、環状アルキル基よりも鎖状アルキル基である方が好ましい。分岐を有する鎖状アルキル基よりも、直鎖状アルキル基の方が好ましい。アルキル基の炭素原子数は、1乃至30であることが好ましく、2乃至30であることがより好ましく、4乃至30であることがさらに好ましく、6乃至30であることが最も好ましい。アルキル基は、置換基を有していてもよい。置換基の例には、ハロゲン原子、アルコキシ基(例、メトキシ、エトキシ、エポキシエチルオキシ)およびアシルオキシ基(例、アクリロイルオキシ、メタクリロイルオキシ)が含まれる。上記アルケニル基は、環状アルケニル基よりも鎖状アルケニル基である方が好ましい。分岐を有する鎖状アルケニル基よりも、直鎖状アルケニル基の方が好ましい。アルケニル基の炭素原子数は、2乃至30であることが好ましく、3乃至30であることがより好ましく、4乃至30であることがさらに好ましく、6乃至30であることが最も好ましい。アルケニル基は、置換基を有していてもよい。置換基の例には、ハロゲン原子、アルコキシ基(例、メトキシ、エトキシ、エポキシエチルオキシ)およびアシルオキシ基(例、アクリロイルオキシ、メタクリロイルオキシ)が含まれる。

【0063】上記アリール基は、フェニルまたはナフチルであることが好ましく、フェニルであることが特に好ましい。アリール基は、置換基を有していてもよい。置換基の例には、ハロゲン原子、ヒドロキシル、シアノ、ニトロ、カルボキシル、アルキル基、アルケニル基、アリール基、アルコキシ基、アルケニルオキシ基、アリールオキシ基、アシルオキシ基、アルコキシカルボニル基、アルケニルオキシカルボニル基、アリールオキシカルボニル基、スルファモイル、アルキル置換スルファモイル基、アルケニル置換スルファモイル基、アリール置換スルファモイル基、スルホンアミド基、カルバモイル、アルキル置換カルバモイル基、アルケニル置換カルバモイル基、アリール置換カルバモイル基、アミド基、アルキルチオ基、アルケニルチオ基、アリールチオ基およびアシル基が含まれる。上記アルキル基は、前述したアルキル基と同様の定義を有する。アルコキシ基、アシルオキシ基、アルコキシカルボニル基、アルキル置換スルファモイル基、スルホンアミド基、アルキル置換カル

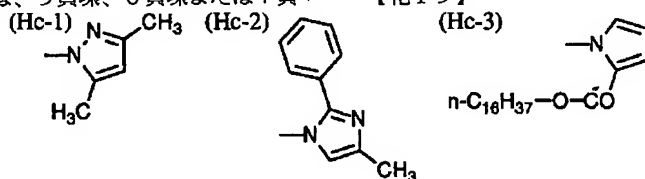
バモイル基、アミド基、アルキルチオ基とアシル基のアルキル部分も、前述したアルキル基と同様である。上記アルケニル基は、前述したアルケニル基と同様の定義を有する。アルケニルオキシ基、アシルオキシ基、アルケニルオキシカルボニル基、アルケニル置換スルファモイル基、スルホンアミド基、アルケニル置換カルバモイル基、アミド基、アルケニルチオ基およびアシル基のアルケニル部分も、前述したアルケニル基と同様である。上記アリール基の例には、フェニル、 α -ナフチル、 β -ナフチル、4-メトキシフェニル、3, 4-ジエトキシフェニル、4-オクチルオキシフェニルおよび4-ドデシルオキシフェニルが含まれる。アリールオキシ基、アシルオキシ基、アリールオキシカルボニル基、アリール置換スルファモイル基、スルホンアミド基、アリール置換カルバモイル基、アミド基、アリールチオ基およびアシル基の部分の例は、上記アリール基の例と同様である。

【0064】 X^1 、 X^2 または X^3 が $-NR-$ 、 $-O-$ または $-S-$ である場合の複素環基は、芳香族性を有することが好ましい。芳香族性を有する複素環は、一般に不飽和複素環であり、好ましくは最多の二重結合を有する複素環である。複素環は、5員環、6員環または7員*

*環であることが好ましく、5員環または6員環であることがさらに好ましく、6員環であることが最も好ましい。複素環のヘテロ原子は、N、SまたはOであることが好ましく、Nであることが特に好ましい。芳香族性を有する複素環としては、ピリジン環（複素環基としては、2-ピリジルまたは4-ピリジル）が特に好ましい。複素環基は、置換基を有していてもよい。複素環基の置換基の例は、上記アリール部分の置換基の例と同様である。 X^1 、 X^2 または X^3 が単結合である場合の複素環基は、窒素原子に遊離原子価をもつ複素環基であることが好ましい。窒素原子に遊離原子価をもつ複素環基は、5員環、6員環または7員環であることが好ましく、5員環または6員環であることがさらに好ましく、5員環であることが最も好ましい。複素環基は、複数の窒素原子を有していてもよい。また、複素環基は、窒素原子以外のヘテロ原子（例、O、S）を有していてもよい。複素環基は、置換基を有していてもよい。複素環基の置換基の例は、上記アリール部分の置換基の例と同様である。以下に、窒素原子に遊離原子価をもつ複素環基の例を示す。

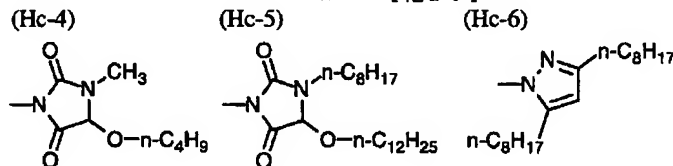
【0065】

【化15】



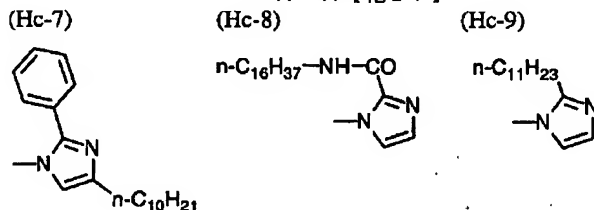
【0066】

※ ※【化16】



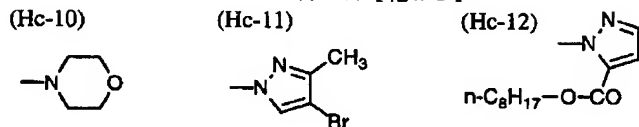
【0067】

★ ★【化17】



【0068】

☆ ☆【化18】



【0069】 R^{31} 、 R^{32} および R^{33} の少なくとも一つ ◆50◆は、炭素原子数が9乃至30のアルキレン部分またはア

ルケニレン部分を含むことが好ましい。炭素原子数が9乃至30のアルキレン部分またはアルケニレン部分は、直鎖状であることが好ましい。アルキレン部分またはアルケニレン部分は、アリール基の置換基に含まれていることが好ましい。また、 R^{31} 、 R^{32} および R^{33} の少なくとも一つは、重合性基を置換基として有することが好ましい。1, 3, 5-トリアジン環を有する化合物は、少なくとも二つの重合性基を有することが好ましい。また、重合性基は、 R^{31} 、 R^{32} または R^{33} の末端に位置することが好ましい。1, 3, 5-トリアジン環を有する化合物に重合性基を導入することで、1, 3, 5-トリアジン環を有する化合物とディスコティック液晶性分子とが重合している状態で光学異方性層に含ませることができる。重合性基を置換基として有する R^{31} 、 R^{32} または R^{33} を、下記式(Rp)で示す。

【0070】(Rp) $-L^5-(Q)_n$

式中、 L^5 は、 $(n+1)$ 価の連結基であり；Qは、重合性基であり；そして、nは1乃至5の整数である。式(RpI)において、 $(n+1)$ 価の連結基(L^5)

は、アルキレン基、アルケニレン基、 $n+1$ 価の芳香族基、二価のヘテロ環残基、 $-CO-$ 、 $-NR-$ (Rは炭素原子数が1乃至30のアルキル基または水素原子)、 $-O-$ 、 $-S-$ および $-SO_2-$ からなる群より選ばれる基を少なくとも二つ組み合わせた連結基であることが好ましい。アルキレン基の炭素原子数は、1乃至12であることが好ましい。アルケニレン基の炭素原子数は、2乃至12であることが好ましい。芳香族基の炭素原子数は、6乃至10であることが好ましい。式(Rp)の L^5 の例を以下に示す。左側が式(III)の X^1 、 X^2 または X^3 に結合(X^1 、 X^2 または X^3 が単結合の場合は、1, 3, 5-トリアジン環に直結)し、右側が(L^{53} ~ L^{59} ではn個の)重合性基(Q)に結合する。ALはアルキレン基またはアルケニレン基、Hcは二価のヘテロ環残基、ARは芳香族基を意味する。なお、アルキレン基、アルケニレン基、ヘテロ環残基および芳香族基は、置換基(例、アルキル基、ハロゲン原子)を有していてもよい。

【0071】 $L51: -AL-O-CO-$

$L52: -AL-O-$

$L53: -AR(-O-AL-O-CO-)_n$

$L54: -AR(-O-AL-O-)_n$

$L55: -AR(-O-CO-AL-O-CO-)_n$

$L56: -AR(-CO-O-AL-O-CO-)_n$

$L57: -AR(-O-CO-AR-O-AL-O-CO-)_n$

$L58: -AR(-NR-SO_2-AL-O-CO-)_n$

$L59: -AR(-SO_2-NR-AL-O-CO-)_n$

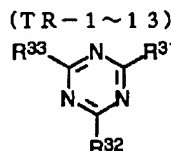
【0072】式(Rp)における重合性基(Q)の例は、ディスコティック液晶性分子の重合性基の例(Q1~Q17)と同様である。重合性基は、1, 3, 5-トリ

リアジン環を有する化合物とディスコティック液晶性分子とを重合させるために使用する。よって、1, 3, 5-トリアジン環を有する化合物の重合性基とディスコティック液晶性分子の重合性基とは、類似の官能基であることが好ましい。従って、ディスコティック液晶性分子の重合性基と同様に、1, 3, 5-トリアジン環を有する化合物の重合性基(Q)は、不飽和重合性基(Q1~Q7)、エポキシ基(Q8)またはアジリジニル基(Q9)であることが好ましく、不飽和重合性基であることがさらに好ましく、エチレン性不飽和重合性基(Q1~Q6)であることが最も好ましい。nが複数(2乃至5)である場合、連結基(L^5)は $n+1$ 価の芳香族基を含み芳香族基において分岐することが好ましい。nは、1乃至3の整数であることが好ましい。

【0073】1, 3, 5-トリアジン環を有する化合物の(メラミン化合物を除く)具体例を以下に示す。

【0074】

【化19】



【0075】TR-1: $R^{31}, R^{32}, R^{33}: -(CH_2)_9-O-CO-CH=CH_2$

TR-2: $R^{31}, R^{32}, R^{33}: -(CH_2)_4-CH=CH-(CH_2)_4-O-CO-CH=CH_2$

TR-3: $R^{31}, R^{32}: -(CH_2)_9-O-CO-CH=CH_2$; $R^{33}: -(CH_2)_{12}-CH_3$

TR-4: $R^{31}, R^{32}: -(CH_2)_4-CH=CH-(CH_2)_4-O-CO-CH=CH_2$; $R^{33}: -(CH_2)_{12}-CH_3$

TR-5: $R^{31}: -(CH_2)_9-O-CO-CH=CH_2$; $R^{32}, R^{33}: -(CH_2)_{12}-CH_3$

TR-6: $R^{31}: -(CH_2)_4-CH=CH-(CH_2)_4-O-CO-CH=CH_2$; $R^{32}, R^{33}: -(CH_2)_{12}-CH_3$

TR-7: $R^{31}, R^{32}: -(CH_2)_4-O-CO-CH=CH_2$; $R^{33}: -(CH_2)_{12}-CH_3$

TR-8: $R^{31}: -(CH_2)_4-O-CO-CH=CH_2$; $R^{32}, R^{33}: -(CH_2)_{12}-CH_3$

TR-9: $R^{31}, R^{32}, R^{33}: -(CH_2)_9-O-EpEt$

TR-10: $R^{31}, R^{32}, R^{33}: -(CH_2)_4-CH=CH-(CH_2)_4-O-EpEt$

TR-11: $R^{31}, R^{32}: -(CH_2)_9-O-EpEt$; $R^{33}: -(CH_2)_{12}-CH_3$

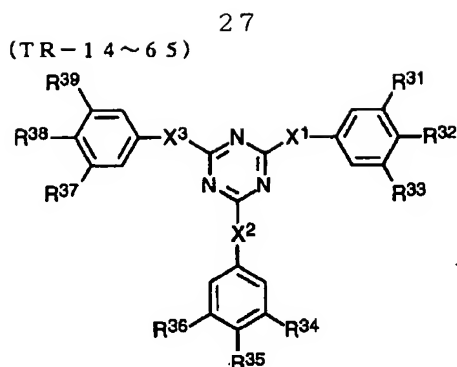
TR-12: $R^{31}, R^{32}, R^{33}: -(CH_2)_9-O-CH=CH_2$

TR-13: $R^{31}, R^{32}: -(CH_2)_9-O-CH=CH_2$; $R^{33}: -(CH_2)_{12}-CH_3$

(註) EpEt: エポキシエチル

【0076】

【化20】



【0077】TR-14: $X^1, X^2, X^3: -O-; R^{32}, R^{35}, R^{38}: -O-(CH_2)_9-O-CO-CH=CH_2$

TR-15: $X^1, X^2, X^3: -O-; R^{31}, R^{32}, R^{34}, R^{35}, R^{37}, R^{38}: -O-(CH_2)_9-O-CO-CH=CH_2$

TR-16: $X^1, X^2, X^3: -O-; R^{32}, R^{35}, R^{38}: -O-(CH_2)_4-CH=CH-(CH_2)_4-O-CO-CH=CH_2$

TR-17: $X^1, X^2, X^3: -O-; R^{31}, R^{32}, R^{34}, R^{35}, R^{37}, R^{38}: -O-(CH_2)_4-CH=CH-(CH_2)_4-O-CO-CH=CH_2$

TR-18: $X^1, X^2, X^3: -O-; R^{31}, R^{33}, R^{34}, R^{36}, R^{37}, R^{39}: -O-(CH_2)_9-O-CO-CH=CH_2$

TR-19: $X^1, X^2, X^3: -O-; R^{31}, R^{32}, R^{33}, R^{34}, R^{35}, R^{36}, R^{37}, R^{38}, R^{39}: -O-(CH_2)_9-O-CO-CH=CH_2$

TR-20: $X^1, X^2: -O-; X^3: -NH-; R^{32}, R^{35}, R^{38}: -O-(CH_2)_9-O-CO-CH=CH_2$

TR-21: $X^1, X^2: -O-; X^3: -NH-; R^{32}, R^{35}: -O-(CH_2)_4-O-CO-CH=CH_2;$

$R^{38}: -O-(CH_2)_{12}-CH_3$

TR-22: $X^1, X^2: -O-; X^3: -NH-; R^{32}, R^{35}: -O-(CH_2)_4-O-CO-CH=CH_2; R^{37}, R^{38}: -O-(CH_2)_{12}-CH_3$

TR-23: $X^1, X^2: -O-; X^3: -NH-; R^{32}, R^{35}: -O-(CH_2)_4-O-CO-CH=CH_2; R^{38}: -O-CO-(CH_2)_{11}-CH_3$

TR-24: $X^1: -O-; X^2, X^3: -NH-; R^{31}, R^{33}: -O-(CH_2)_{12}-CH_3; R^{35}, R^{38}: -O-(CH_2)_9-O-CO-CH=CH_2$

TR-25: $X^1: -O-; X^2, X^3: -NH-; R^{31}, R^{32}: -O-(CH_2)_6-O-CO-CH=CH_2; R^{35}, R^{38}: -O-(CH_2)_{11}-CH_3$

TR-26: $X^1: -O-; X^2, X^3: -NH-; R^{31}, R^{32}, R^{33}: -O-(CH_2)_6-O-CO-CH=CH_2; R^{35}, R^{38}: -O-(CH_2)_{11}-CH_3$

【0078】TR-27: $X^1, X^2: -NH-; X^3: -S-; R^{32}, R^{35}: -O-(CH_2)_9-O-CO-CH=CH_2; R^{38}: -O-CO-(CH_2)_{11}-CH_3$

TR-28: $X^1, X^2: -NH-; X^3: -S-; R^{31}, R^{32}, R^{34}, R^{35}: -O-(CH_2)_9-O-CO-CH=CH_2; R^{38}: -O-CO-(CH_2)_{11}-CH_3$

TR-29: $X^1, X^2: -NH-; X^3: -S-; R^{32}, R^{35}: -O-(CH_2)_4-CH=CH-(CH_2)_4-O-CO-CH=CH_2; R^{38}: -O-CO-(CH_2)_{11}-CH_3$

TR-30: $X^1, X^2: -NH-; X^3: -S-; R^{31}, R^{32}, R^{34}, R^{35}: -O-(CH_2)_4-CH=CH-(CH_2)_4-O-CO-CH=CH_2; R^{38}: -O-CO-(CH_2)_{11}-CH_3$

TR-31: $X^1, X^2: -NH-; X^3: -S-; R^{31}, R^{33}, R^{34}, R^{36}: -O-(CH_2)_9-O-CO-CH=CH_2; R^{38}: -O-CO-(CH_2)_{11}-CH_3$

TR-32: $X^1, X^2: -NH-; X^3: -S-; R^{31}, R^{32}, R^{33}, R^{34}, R^{35}, R^{36}: -O-(CH_2)_9-O-CO-CH=CH_2; R^{38}: -O-CO-(CH_2)_{11}-CH_3$

TR-33: $X^1, X^2: -O-; X^3: -S-; R^{32}, R^{35}, R^{38}: -O-(CH_2)_9-O-CO-CH=CH_2$

TR-34: $X^1, X^2: -O-; X^3: -S-; R^{32}, R^{35}: -O-(CH_2)_4-O-CO-CH=CH_2; R^{38}: -O-(CH_2)_{12}-CH_3$

TR-35: $X^1, X^2: -O-; X^3: -S-; R^{32}, R^{35}: -O-(CH_2)_4-O-CO-CH=CH_2; R^{37}, R^{38}: -O-(CH_2)_{12}-CH_3$

TR-36: $X^1, X^2: -O-; X^3: -S-; R^{32}, R^{35}: -O-(CH_2)_4-O-CO-CH=CH_2; R^{38}: -O-CO-(CH_2)_{11}-CH_3$

TR-37: $X^1: -O-; X^2, X^3: -S-; R^{31}, R^{33}: -O-(CH_2)_{12}-CH_3; R^{35}, R^{38}: -O-(CH_2)_9-O-CO-CH=CH_2$

TR-38: $X^1: -O-; X^2, X^3: -S-; R^{31}, R^{32}: -O-(CH_2)_6-O-CO-CH=CH_2; R^{35}, R^{38}: -O-(CH_2)_{11}-CH_3$

TR-39: $X^1: -O-; X^2, X^3: -S-; R^{31}, R^{32}, R^{33}: -O-(CH_2)_6-O-CO-CH=CH_2; R^{35}, R^{38}: -O-(CH_2)_{11}-CH_3$

【0079】TR-40: $X^1, X^2, X^3: -S-; R^{32}, R^{35}, R^{38}: -O-(CH_2)_9-O-CO-CH=CH_2$

TR-41: $X^1, X^2, X^3: -S-; R^{31}, R^{32}, R^{34}, R^{35}, R^{37}, R^{38}: -O-(CH_2)_9-O-CO-CH=CH_2$

TR-42: $X^1, X^2, X^3: -S-; R^{32}, R^{35}, R^{38}: -O-(CH_2)_4-CH=CH-(CH_2)_4-O-CO-CH=CH_2$

TR-43: $X^1, X^2, X^3: -S-; R^{31}, R^{32}, R^{34}, R^{35}, R^{37}, R^{38}: -O-(CH_2)_4-CH=CH-(CH_2)_4-O-CO-CH=CH_2$

TR-44: $X^1, X^2, X^3: -S-; R^{31}, R^{33}, R^{34}, R^{36}, R^{37}, R^{39}: -O-(CH_2)_9-O-CO-CH=CH_2$

TR-45: $X^1, X^2, X^3: -S-; R^{31}, R^{32}, R^{33}, R^{34}, R^{35}, R^{36}, R^{37}, R^{38}, R^{39}: -O-(CH_2)_9-O-CO-CH=CH_2$

TR-46: $X^1, X^2: -S-; X^3: -NH-; R^{32}, R^{35}, R^{38}: -O-(CH_2)_9-O-CO-CH=CH_2$

TR-47: $X^1, X^2: -S-; X^3: -NH-; R^{32}, R^{35}: -O-(CH_2)_4-O-CO-CH=CH_2; R^{38}: -O-(CH_2)_{12}-CH_3$

TR-48: $X^1, X^2: -S-; X^3: -NH-; R^{32}, R^{35}: -O-(CH_2)_4-O-CO-CH=CH_2; R^{37}, R^{38}: -O-(CH_2)_{12}-CH_3$

TR-49: $X^1, X^2: -S-; X^3: -NH-; R^{32}, R^{35}: -O-(CH_2)_4-O-CO-CH=CH_2; R^{38}: -O-CO-(CH_2)_{11}-CH_3$

TR-50: $X^1: -O-; X^2: -NH-; X^3: -S-; R^{31}, R^{33}: -O-(CH_2)_{12}-CH_3; R^{35}: -O-(CH_2)_9-O-CO-CH=CH_2; R^{38}: -O-(CH_2)_{12}-CH_3$

TR-51: $X^1: -O-; X^2: -NH-; X^3: -S-; R^{31}, R^{32}: -O-(CH_2)_6-O-CO-CH=CH_2;$

$R^{35}: -O-(CH_2)_{11}-CH_3; R^{38}: -O-(CH_2)_{12}-CH_3$

TR-52: $X^1: -O-; X^2: -NH-; X^3: -S-; R^{31}, R^{32}, R^{33}: -O-(CH_2)_6-O-CO-CH=CH_2; R^{35}: -O-(CH_2)_{11}-CH_3; R^{38}: -O-(CH_2)_{12}-CH_3$

【0080】TR-53: $X^1, X^2, X^3: -O-; R^{32}, R^{35}, R^{38}: -O-(CH_2)_9-O-EpEt$

TR-54: $X^1, X^2, X^3: -O-; R^{31}, R^{32}, R^{34}, R^{35}, R^{37}, R^{38}: -O-(CH_2)_9-O-EpEt$

TR-55: $X^1, X^2, X^3: -O-; R^{32}, R^{35}, R^{38}: -O-(CH_2)_4-CH=CH-(CH_2)_4-O-EpEt$

TR-56: $X^1, X^2, X^3: -O-; R^{31}, R^{32}, R^{34}, R^{35}, R^{37}, R^{38}: -O-(CH_2)_4-CH=CH-(CH_2)_4-O-EpEt$

TR-57: $X^1, X^2, X^3: -O-; R^{31}, R^{33}, R^{34}, R^{36}, R^{37}, R^{39}: -O-(CH_2)_9-O-EpEt$

TR-58: $X^1, X^2, X^3: -O-; R^{32}, R^{35}, R^{38}: -O-(CH_2)_9-O-CH=CH_2$

TR-59: $X^1, X^2: -O-; X^3: -NH-; R^{32}, R^{35}, R^{38}: -O-(CH_2)_9-O-EpEt$

TR-60: $X^1, X^2: -O-; X^3: -NH-; R^{32}, R^{35}: -O-(CH_2)_4-O-EpEt; R^{38}: -O-(CH_2)_{12}-CH_3$

TR-61: $X^1, X^2: -O-; X^3: -NH-; R^{32}, R^{35}: -O-(CH_2)_4-O-EpEt; R^{37}, R^{38}: -O-(CH_2)_{12}-CH_3$

TR-62: $X^1, X^2: -O-; X^3: -NH-; R^{32}, R^{35}: -O-(CH_2)_4-O-EpEt; R^{38}: -O-CO-(CH_2)_{11}-CH_3$

TR-63: $X^1: -O-; X^2, X^3: -NH-; R^{31}, R^{33}: -O-(CH_2)_{12}-CH_3; R^{35}, R^{38}: -O-(CH_2)_9-O-EpEt$

TR-64: $X^1: -O-; X^2, X^3: -NH-; R^{31}, R^{32}: -O-(CH_2)_6-O-EpEt; R^{35}, R^{38}: -O-(CH_2)_{11}-CH_3$

TR-65: $X^1, X^2: -O-; X^3: -NH-; R^{32}, R^{35}, R^{38}: -O-(CH_2)_9-O-CH=CH_2$

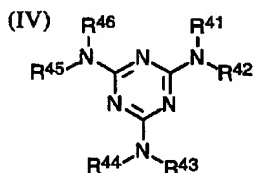
(注) 定義のないR: 無置換(水素原子)

EpEt: エポキシエチル

【0081】1, 3, 5-トリアジン環を有する化合物は、下記式(IV)で表されるメラミン化合物であることが好ましい。

【0082】

【化21】



【0083】式中、 R^{41} 、 R^{43} および R^{45} は、それぞれ独立に、炭素原子数が1乃至30のアルキル基または水素原子であり、 R^{42} 、 R^{44} および R^{46} は、それぞれ独立にアルキル基、アルケニル基、アリール基または複素環基であるか、あるいは、 R^{41} と R^{42} 、 R^{43} と R^{44} または R^{45} と R^{46} が結合して、複素環を形成する。 R^{41} 、 R^{43} および R^{45} は、炭素原子数が1乃至20のアルキル基または水素原子であることが好ましく、炭素原子数が1乃至10のアルキル基または水素原子であることがより好ましく、炭素原子数が1乃至6のアルキル基または水素原子であることがさらに好ましく、水素原子であることが最も好ましい。 R^{42} 、 R^{44} および R^{46} は、アリール基であることが特に好ましい。上記アルキル基、アルケニル基、アリール基および複素環基の定義および置換基は、前記式(III)で説明した各基の定義および置換基と同様である。 R^{41} と R^{42} 、 R^{43} と R^{44} または R^{45} と R^{46} が結合して形成する複素環は、前記式(III)で説明した窒素原子に遊離原子価をもつ複素環基と同様である。

【0084】 R^{42} 、 R^{44} および R^{46} の少なくとも一つ

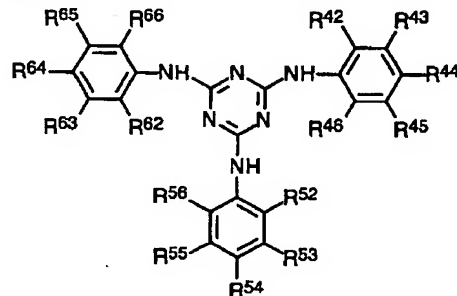
は、炭素原子数が9乃至30のアルキレン部分またはアルケニレン部分を含むことが好ましい。炭素原子数が9乃至30のアルキレン部分またはアルケニレン部分は、直鎖状であることが好ましい。アルキレン部分またはアルケニレン部分は、アリール基の置換基に含まれていることが好ましい。また、 R^{42} 、 R^{44} および R^{46} の少なくとも一つは、重合性基を置換基として有することが好ましい。メラミン化合物は、少なくとも二つの重合性基を有することが好ましい。また、重合性基は、 R^{42} 、 R^{44} および R^{46} の末端に位置することが好ましい。メラミン化合物に重合性基を導入することで、メラミン化合物とディスコティック液晶性分子とが重合している状態で光学異方性層に含ませることができる。重合性基を置換基として有する R^{42} 、 R^{44} および R^{46} は、前述した式(Rp)で示される基と同様である。

【0085】メラミン化合物の具体例を以下に示す。

【0086】

【化22】

(MM-1~46)



【0087】MM-1: $R^{43}, R^{44}, R^{53}, R^{54}, R^{63}, R^{64}: -O-(CH_2)_9-CH_3$

MM-2: $R^{43}, R^{44}, R^{53}, R^{54}, R^{63}, R^{64}: -O-(CH_2)_{11}-CH_3$

MM-3: $R^{43}, R^{44}, R^{53}, R^{54}, R^{63}, R^{64}: -O-(CH_2)_{15}-CH_3$

MM-4: $R^{44}, R^{54}, R^{64}: -O-(CH_2)_9-CH_3$

MM-5: $R^{44}, R^{54}, R^{64}: -O-(CH_2)_{15}-CH_3$

MM-6: $R^{43}, R^{53}, R^{63}: -O-CH_3; R^{44}, R^{54}, R^{64}: -O-(CH_2)_{17}-CH_3$

MM-7: $R^{44}, R^{54}, R^{64}: -CO-O-(CH_2)_{11}-CH_3$

MM-8: $R^{44}, R^{54}, R^{64}: -SO_2-NH-(CH_2)_{17}-CH_3$

MM-9: $R^{43}, R^{53}, R^{63}: -O-CO-(CH_2)_{15}-CH_3$

MM-10: $R^{42}, R^{52}, R^{62}: -O-(CH_2)_{17}-CH_3$

MM-11: $R^{42}, R^{52}, R^{62}: -O-CH_3; R^{43}, R^{53}, R^{63}: -CO-O-(CH_2)_{11}-CH_3$

MM-12: $R^{42}, R^{52}, R^{62}: -Cl; R^{43}, R^{53}, R^{63}: -CO-O-(CH_2)_{11}-CH_3$

MM-13: $R^{42}, R^{52}, R^{62}: -O-(CH_2)_{11}-CH_3; R^{45}, R^{55}, R^{65}: -SO_2-NH-iso-C_3H_7$

【0088】MM-14: $R^{42}, R^{52}, R^{62}: -Cl; R^{45}, R^{55}, R^{65}: -SO_2-NH-(CH_2)_{15}-CH_3$

MM-15: $R^{42}, R^{46}, R^{52}, R^{56}, R^{62}, R^{66}: -Cl; R^{45}, R^{55}, R^{65}: -$

-SO₂-NH-(CH₂)₉-CH₃

MM-16: R⁴³, R⁵⁴: -O-(CH₂)₉-CH₃; R⁴⁴, R⁵³, R⁶³, R⁶⁴: -O-(CH₂)₁₁-CH₃

MM-17: R⁴⁴: -O-(CH₂)₁₁-CH₃; R⁵⁴: -O-(CH₂)₁₅-CH₃; R⁶⁴: -O-(CH₂)₁₇-CH₃

MM-18: R⁴², R⁴⁵, R⁵², R⁵⁵, R⁶², R⁶⁵: -O-CH₃; R⁴⁴, R⁵⁴, R⁶⁴: -NH-CO-(CH₂)₁₄-CH₃

MM-19: R⁴², R⁴⁵, R⁵², R⁵⁵, R⁶², R⁶⁵: -O-(CH₂)₃-CH₃; R⁴⁴, R⁵⁴, R⁶⁴: -O-(CH₂)₁₅-CH₃

MM-20: R⁴², R⁵², R⁶²: -NH-SO₂-(CH₂)₁₅-CH₃; R⁴⁴, R⁴⁵, R⁵⁴, R⁵⁵, R⁶⁴, R⁶⁵: -Cl

MM-21: R⁴², R⁴³, R⁵², R⁵³, R⁶², R⁶³: -F; R⁴⁴, R⁵⁴, R⁶⁴: -CO-NH-(CH₂)₁₅-CH₃; R⁴⁵, R⁴⁶, R⁵⁵, R⁵⁶, R⁶⁵, R⁶⁶: -Cl

MM-22: R⁴², R⁵², R⁶²: -Cl; R⁴⁴, R⁵⁴, R⁶⁴: -CH₃; R⁴⁵, R⁵⁵, R⁶⁵: -NH-CO-(CH₂)₁₂-CH₃

MM-23: R⁴², R⁵², R⁶²: -OH; R⁴⁴, R⁵⁴, R⁶⁴: -CH₃; R⁴⁵, R⁵⁵, R⁶⁵: -O-(CH₂)₁₅-CH₃

MM-24: R⁴², R⁴⁵, R⁵², R⁵⁵, R⁶², R⁶⁵: -O-CH₃; R⁴⁴, R⁵⁴, R⁶⁴: -O-(CH₂)₁₁-CH₃

MM-25: R⁴², R⁵², R⁶²: -NH-SO₂-CH₃; R⁴⁵, R⁵⁵, R⁶⁵: -CO-O-(CH₂)₁₁-CH₃

MM-26: R⁴², R⁵², R⁶²: -S-(CH₂)₁₁-CH₃; R⁴⁵, R⁵⁵, R⁶⁵: -SO₂-NH₂

【0089】MM-27: R⁴³, R⁴⁴, R⁵³, R⁵⁴, R⁶³, R⁶⁴: -O-(CH₂)₁₂-O-CO-CH=CH₂

MM-28: R⁴³, R⁴⁴, R⁵³, R⁵⁴, R⁶³, R⁶⁴: -O-(CH₂)₈-O-CO-CH=CH₂

MM-29: R⁴³, R⁴⁴, R⁵³, R⁵⁴, R⁶³, R⁶⁴: -O-CO-(CH₂)₇-O-CO-CH=CH₂

MM-30: R⁴⁴, R⁵⁴, R⁶⁴: -CO-O-(CH₂)₁₂-O-CO-C(CH₃)=CH₂

MM-31: R⁴³, R⁴⁴, R⁵³, R⁵⁴, R⁶³, R⁶⁴: -O-CO-p-Ph-O-(CH₂)₄-O-CO-CH=CH₂

MM-32: R⁴², R⁴⁴, R⁵², R⁵⁴, R⁶², R⁶⁴: -NH-SO₂-(CH₂)₈-O-CO-CH=CH₂; R⁴⁵, R⁵⁵, R⁶⁵: -Cl

MM-33: R⁴², R⁵², R⁶²: -NH-SO₂-CH₃; R⁴⁵, R⁵⁵, R⁶⁵: -CO-O-(CH₂)₁₂-O-CO-CH=CH₂

【0090】MM-34: R⁴⁴, R⁵⁴, R⁶⁴: -O-(CH₂)₉-O-CO-CH=CH₂

MM-35: R⁴³, R⁴⁴, R⁵³, R⁵⁴, R⁶³, R⁶⁴: -O-(CH₂)₉-O-CO-CH=CH₂

MM-36: R⁴⁴, R⁵⁴, R⁶⁴: -O-(CH₂)₄-CH=CH-(CH₂)₄-O-CO-CH=CH₂

MM-37: R⁴³, R⁴⁴, R⁵³, R⁵⁴, R⁶³, R⁶⁴: -O-(CH₂)₄-CH=CH-(CH₂)₄-O-CO-CH=CH₂

MM-38: R⁴³, R⁴⁵, R⁵³, R⁵⁵, R⁶³, R⁶⁵: -O-(CH₂)₉-O-CO-CH=CH₂

MM-39: R⁴³, R⁴⁴, R⁴⁵, R⁵³, R⁵⁴, R⁵⁵, R⁶³, R⁶⁴, R⁶⁵: -O-(CH₂)₉-O-CO-CH=CH₂

MM-40: R⁴⁴, R⁵⁴: -O-(CH₂)₄-O-CO-CH=CH₂; R⁶⁴: -O-(CH

2)₉-O-CO-CH=CH₂

MM-41: R⁴⁴, R⁵⁴: -O-(CH₂)₄-O-CO-CH=CH₂; R⁶⁴: -O-(CH₂)₁₂-CH₃

MM-42: R⁴⁴, R⁵⁴: -O-(CH₂)₄-O-CO-CH=CH₂; R⁶³, R⁶⁴: -O-(CH₂)₁₂-CH₃

MM-43: R⁴⁴, R⁵⁴: -O-(CH₂)₄-O-CO-CH=CH₂; R⁶³, R⁶⁴: -O-CO-(CH₂)₁₁-CH₃

MM-44: R⁴³, R⁴⁵: -O-(CH₂)₁₂-CH₃; R⁵⁴, R⁶⁴: -O-(CH₂)₉-O-CO-CH=CH₂

MM-45: R⁴³, R⁴⁴: -O-(CH₂)₆-O-CO-CH=CH₂; R⁵⁴, R⁶⁴: -O-(CH₂)₁₁-CH₃

MM-46: R⁴³, R⁴⁴, R⁴⁵: -O-(CH₂)₆-O-CO-CH=CH₂; R⁵⁴, R⁶⁴: -O-(CH₂)₁₁-CH₃

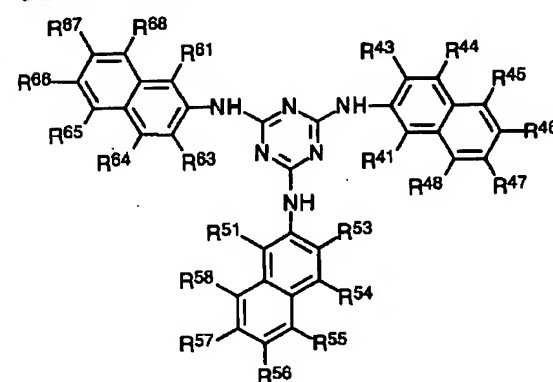
(註) 定義のないR: 無置換(水素原子)

p-Ph: p-フェニレン

【0091】

【化23】

(MM-47~59)



【0092】MM-47: R⁴⁶, R⁵⁶, R⁶⁶: -SO₂-NH-(CH₂)₁₅-CH₃; R⁴⁸, R⁵⁸, R⁶⁸: -O-(CH₂)₁₁-CH₃

MM-48: R⁴⁵, R⁵⁵, R⁶⁵: -SO₂-NH-(CH₂)₁₇-CH₃

MM-49: R⁴⁶, R⁵⁶, R⁶⁶: -SO₂-NH-(CH₂)₁₅-CH₃

MM-50: R⁴⁵, R⁵⁵, R⁶⁵: -O-(CH₂)₁₇-CH₃; R⁴⁷, R⁵⁷, R⁶⁷: -SO₂-NH-CH₃

MM-51: R⁴³, R⁵³, R⁶³: -O-(CH₂)₁₅-CH₃

MM-52: R⁴¹, R⁵¹, R⁶¹: -O-(CH₂)₁₇-CH₃

MM-53: R⁴⁶, R⁵⁶, R⁶⁶: -SO₂-NH-Ph; R⁴⁸, R⁵⁸, R⁶⁸: -O-(CH₂)₁₁-CH₃

MM-54: R⁴⁵, R⁵⁵, R⁶⁵: -O-(CH₂)₂₁-CH₃; R⁴⁷, R⁵⁷, R⁶⁷: -SO₂-NH-Ph

MM-55: R⁴¹, R⁵¹, R⁶¹: -p-Ph-(CH₂)₁₁-CH₃

MM-56: R⁴⁶, R⁴⁸, R⁵⁶, R⁵⁸, R⁶⁶, R⁶⁸: -SO₂-NH-(CH₂)₇-CH₃

MM-57: R⁴⁵, R⁵⁶, R⁶⁶: -SO₂-NH-(CH₂)₁₀-O-CO-CH=CH₂; R⁴⁸, R⁵⁸, R⁶⁸: -O-(CH₂)₁₂-CH₃

MM-58: R⁴⁵, R⁵⁶, R⁶⁵: -O-(CH₂)₁₂-O-CO-CH=CH₂; R⁴⁷, R⁵⁷, R⁶⁷: -SO₂-NH-Ph

MM-59: R⁴³, R⁵³, R⁶³: -O-(CH₂)₁₆-O-CO-CH=CH₂

(註) 定義のないR: 無置換(水素原子)

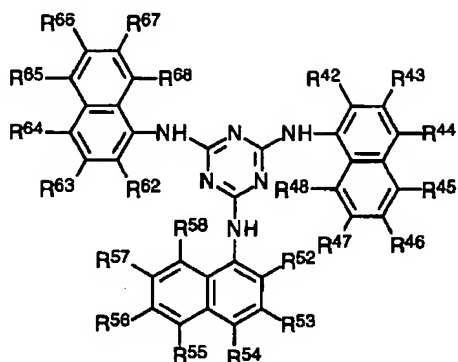
Ph: フェニル

p-Ph: p-フェニレン

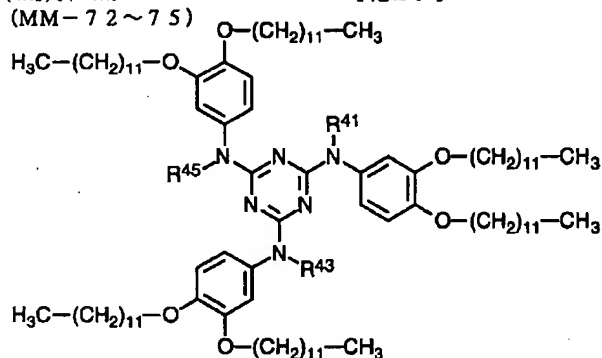
【0093】

【化24】

(MM-60~71)

【0094】MM-60: R⁴⁵, R⁵⁵, R⁶⁵: -NH-CO-(CH₂)₁₄-C
H₃MM-61: R⁴², R⁵², R⁶²: -O-(CH₂)₁₇-CH₃

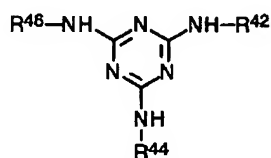
(MM-72~75)

【0096】MM-72: R⁴¹, R⁴³, R⁴⁵: -CH₃MM-73: R⁴¹, R⁴³, R⁴⁵: -C₂H₅MM-74: R⁴¹, R⁴³: -C₂H₅; R⁴⁵: -CH₃MM-75: R⁴¹, R⁴³, R⁴⁵: -(CH₂)₃-CH₃

【0097】

【化26】

(MM-76~88)

【0098】MM-76: R⁴², R⁴⁴, R⁴⁶: -(CH₂)₉-O-CO-CH=CH₂MM-77: R⁴², R⁴⁴, R⁴⁶: -(CH₂)₄-CH=CH-(CH₂)₄-O-CO-CH=CH₂MM-78: R⁴², R⁴⁴: -(CH₂)₉-O-CO-CH=CH₂; R⁴⁶: -(CH₂)₁₂-CH₃MM-79: R⁴², R⁴⁴: -(CH₂)₄-CH=CH-(CH₂)₄-O-CO-CH=CH₂; R⁴⁶: -(CH₂)₁₂-CH₃* MM-62: R⁴⁴, R⁵⁴, R⁶⁴: -O-(CH₂)₁₅-CH₃MM-63: R⁴⁵, R⁵⁵, R⁶⁵: -SO₂-NH-(CH₂)₁₅-CH₃MM-64: R⁴³, R⁵³, R⁶³: -CO-NH-(CH₂)₁₇-CH₃; R⁴⁴, R⁵⁴, R⁶⁴: -OHMM-65: R⁴⁵, R⁵⁵, R⁶⁵: -O-(CH₂)₁₅-CH₃; R⁴⁶, R⁵⁶, R⁶⁶: -SO₂-NH-(CH₂)₁₁-CH₃MM-66: R⁴⁷, R⁵⁷, R⁶⁷: -O-(CH₂)₂₁-CH₃MM-67: R⁴⁴, R⁵⁴, R⁶⁴: -O-p-Ph-(CH₂)₁₁-CH₃MM-68: R⁴⁶, R⁵⁶, R⁶⁶: -SO₂-NH-(CH₂)₁₅-CH₃10 MM-69: R⁴³, R⁵³, R⁶³: -CO-NH-(CH₂)₁₇-CH₃; R⁴⁴, R⁵⁴, R⁶⁴: -O-(CH₂)₁₂-O-CO-CH=CH₂MM-70: R⁴⁵, R⁵⁵, R⁶⁵: -O-(CH₂)₈-O-CO-CH=CH₂; R⁴⁶, R⁵⁶, R⁶⁶: -SO₂-NH-(CH₂)₁₁-CH₃MM-71: R⁴³, R⁴⁶, R⁵³, R⁵⁶, R⁶³, R⁶⁶: -SO₂-NH-(CH₂)₈-O-CO-CH=CH₂

(註) 定義のないR: 無置換(水素原子)

p-Ph: p-フェニレン

【0095】

【化25】

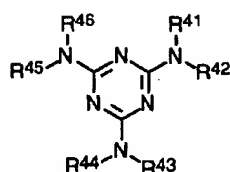
※ MM-80: R⁴²: -(CH₂)₉-O-CO-CH=CH₂; R⁴⁴, R⁴⁶: -(CH₂)₁₂-CH₃MM-81: R⁴²: -(CH₂)₄-CH=CH-(CH₂)₄-O-CO-CH=CH₂; R⁴⁴, R⁴⁶: -(CH₂)₁₂-CH₃MM-82: R⁴², R⁴⁴: -(CH₂)₄-O-CO-CH=CH₂; R⁴⁶: -(CH₂)₁₂-CH₃MM-83: R⁴²: -(CH₂)₄-O-CO-CH=CH₂; R⁴⁴, R⁴⁶: -(CH₂)₁₂-CH₃MM-84: R⁴², R⁴⁴, R⁴⁶: -(CH₂)₉-O-EpEt40 MM-85: R⁴², R⁴⁴, R⁴⁶: -(CH₂)₄-CH=CH-(CH₂)₄-O-EpEtMM-86: R⁴², R⁴⁴: -(CH₂)₉-O-EpEt; R⁴⁶: -(CH₂)₁₂-CH₃MM-87: R⁴², R⁴⁴, R⁴⁶: -(CH₂)₉-O-CH=CH₂MM-88: R⁴², R⁴⁴: -(CH₂)₉-O-CH=CH₂; R⁴⁶: -(CH₂)₁₂-CH₃

(註) EpEt: エポキシエチル

【0099】

【化27】

35
(MM-89~95)

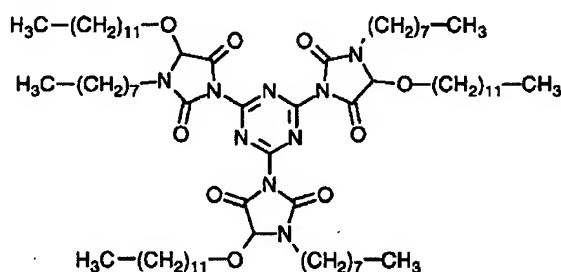


【0100】MM-89: R⁴¹, R⁴², R⁴³, R⁴⁴, R⁴⁵, R⁴⁶: -(CH₂)₉-CH₃

MM-90: R⁴¹, R⁴³, R⁴⁵: -CH₃; R⁴², R⁴⁴, R⁴⁶: -(CH₂)₁₇-CH₃

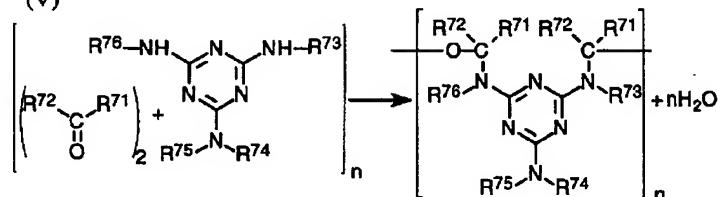
3

(MM-96)



【0102】メラミン化合物として、メラミンポリマーを用いてもよい。メラミンポリマーは、下記式(V)で示すメラミン化合物とカルボニル化合物との重合反応に※

(V)



【0104】式中、R⁷¹、R⁷²、R⁷³、R⁷⁴、R⁷⁵およびR⁷⁶は、それぞれ独立に、水素原子、アルキル基、アルケニル基、アリール基または複素環基である。上記アルキル基、アルケニル基、アリール基および複素環基の定義および置換基は、前記式(III)で説明した各基の定義および置換基と同様である。メラミン化合物とカルボニル化合物との重合反応は、通常のメラミン樹脂(例、メラミンホルムアルデヒド樹脂)の合成方法と同様である。市販のメラミンポリマー(メラミン樹脂)を用いてもよい。メラミンポリマーの分子量は、2千以上40万以下であることが好ましい。

【0105】R⁷¹、R⁷²、R⁷³、R⁷⁴、R⁷⁵およびR⁷⁶の少なくとも一つは、炭素原子数が9乃至30のアルキレン部分またはアルケニレン部分を含むことが好ましい。炭素原子数が9乃至30のアルキレン部分またはアルケニレン部分は、直鎖状であることが好ましい。アルキレン部分またはアルケニレン部分は、アリール基の置換基に含まれていることが好ましい。また、R⁷¹、R⁷²、R⁷³、R⁷⁴、R⁷⁵およびR⁷⁶の少なくとも一つ

★50

36

* MM-91: R⁴¹, R⁴², R⁴³, R⁴⁴: -(CH₂)₇-CH₃; R⁴⁵, R⁴⁶: -(CH₂)₅-CH₃

MM-92: R⁴¹, R⁴², R⁴³, R⁴⁴, R⁴⁵, R⁴⁶: -CyHx

MM-93: R⁴¹, R⁴², R⁴³, R⁴⁴, R⁴⁵, R⁴⁶: -(CH₂)₂-O-C₂H₅

MM-94: R⁴¹, R⁴³, R⁴⁵: -CH₃; R⁴², R⁴⁴, R⁴⁶: -(CH₂)₁₂-O-CO-CH=CH₂

MM-95: R⁴¹, R⁴², R⁴³, R⁴⁴, R⁴⁵, R⁴⁶: -(CH₂)₈-O-CO-CH=CH₂

(註) CyHx: シクロヘキシル

【0101】

【化28】

※より合成することが好ましい。

【0103】

【化29】

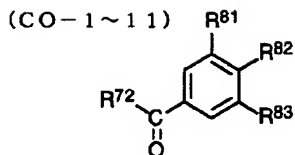
★は、重合性を置換基として有することが好ましい。また、重合性は、R⁷¹、R⁷²、R⁷³、R⁷⁴、R⁷⁵およびR⁷⁶の末端に位置することが好ましい。メラミンポリマーに重合性を導入することで、メラミンポリマーとディスプレイック液晶性分子とが重合している状態で光学異方性層に含ませることができる。重合性を置換基として有するR⁷¹、R⁷²、R⁷³、R⁷⁴、R⁷⁵およびR⁷⁶は、前述した式(Rp)で示される基と同様である。重合性は、カルボニル化合物(R⁷¹、R⁷²)とメラミン化合物(R⁷³、R⁷⁴、R⁷⁵、R⁷⁶)の一方に導入すればよい。メラミン化合物が重合性を有する場合は、カルボニル化合物はホルムアルデヒドのような簡単な化学構造の化合物が好ましく用いられる。カルボニル化合物が重合性を有する場合は、メラミン化合物は、(無置換)メラミンのような簡単な化学構造の化合物が好ましく用いられる。

【0106】重合性を有するカルボニル化合物の例を以下に示す。

【0107】

37

【化30】



【0108】CO-1: R⁷²: -H; R⁸²: -O-(CH₂)₉-O-CO-CH=CH₂

CO-2: R⁷²: -H; R⁸¹, R⁸²: -O-(CH₂)₉-O-CO-CH=CH₂

CO-3: R⁷²: -H; R⁸²: -O-(CH₂)₄-CH=CH-(CH₂)₄-O-CO-CH=CH₂

CO-4: R⁷²: -H; R⁸¹, R⁸²: -O-(CH₂)₄-CH=CH-(CH₂)₄-O-CO-CH=CH₂

CO-5: R⁷²: -H; R⁸¹, R⁸³: -O-(CH₂)₉-O-CO-CH=CH₂

CO-6: R⁷²: -H; R⁸¹, R⁸², R⁸³: -O-(CH₂)₉-O-CO-CH=CH₂

CO-7: R⁷²: -CH₃; R⁸²: -O-(CH₂)₉-O-CO-CH=CH₂

CO-8: R⁷²: -(CH₂)₁₁-CH₃; R⁸²: -O-(CH₂)₄-O-CO-CH=CH₂

CO-9: R⁷²: -(CH₂)₉-O-CO-CH=CH₂; R⁸²: -O-(CH₂)₄-O-CO-CH=CH₂

CO-10: R⁷²: -(CH₂)₉-O-CO-EpEt; R⁸²: -O-(CH₂)₄-O-CO-CH=CH₂

CO-11: R⁷²: -(CH₂)₄-O-CO-CH=CH₂; R⁸¹, R⁸³: -O-(CH₂)₁₂-CH₃

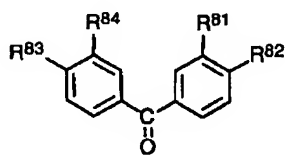
(註) 定義のないR: 無置換(水素原子)

EpEt: エポキシエチル

【0109】

【化31】

(CO-12~13)



【0110】CO-12: R⁸¹, R⁸², R⁸³, R⁸⁴: -O-(CH₂)₆-O-CO-CH=CH₂

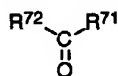
CO-13: R⁸², R⁸³: -O-(CH₂)₉-O-CO-CH=CH₂

(註) 定義のないR: 無置換(水素原子)

【0111】

【化32】

(CO-14~26)



【0112】CO-14: R⁷¹: -(CH₂)₉-O-CO-CH=CH₂; R⁷²: -H

CO-15: R⁷¹: -(CH₂)₄-CH=CH-(CH₂)₄-O-CO-CH=CH₂; R⁷²: -H

CO-16: R⁷¹: -(CH₂)₉-O-CO-CH=CH₂; R⁷²: -CH₃

38

CO-17: R⁷¹: -(CH₂)₄-CH=CH-(CH₂)₄-O-CO-CH=CH₂; R⁷²: -CH₃

CO-18: R⁷¹: -(CH₂)₉-O-CO-CH=CH₂; R⁷²: -Ph

CO-19: R⁷¹: -(CH₂)₄-CH=CH-(CH₂)₄-O-CO-CH=CH₂; R⁷²: -Ph

CO-20: R⁷¹: -(CH₂)₄-O-CO-CH=CH₂; R⁷²: -(CH₂)₉-O-CO-CH=CH₂

CO-21: R⁷¹: -(CH₂)₄-O-CO-CH=CH₂; R⁷²: -(CH₂)₁₂-CH₃

CO-22: R⁷¹: -(CH₂)₉-O-EpEt; R⁷²: -H

CO-23: R⁷¹: -(CH₂)₄-CH=CH-(CH₂)₄-O-EpEt; R⁷²: -H

CO-24: R⁷¹, R⁷²: -(CH₂)₉-O-EpEt

CO-25: R⁷¹, R⁷²: -(CH₂)₉-O-CO-CH=CH₂

CO-26: R⁷¹, R⁷²: -(CH₂)₄-CH=CH-(CH₂)₄-O-CO-CH=CH₂

(註) Ph: フェニル

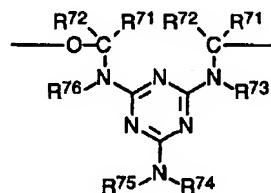
EpEt: エポキシエチル

【0113】メラミン化合物側に重合性基を有するメラミンポリマーの例を以下に示す。

【0114】

【化33】

(MP-1~14)



【0115】MP-1: R⁷³, R⁷⁵, R⁷⁶: -CH₂-NH-CO-CH=CH₂; R⁷⁴: -CH₂-NH-CO-(CH₂)₈-CH₃

MP-2: R⁷¹: -CH₃; R⁷³, R⁷⁵, R⁷⁶: -CH₂-NH-CO-CH=CH₂; R⁷⁴: -CH₂-NH-CO-(CH₂)₈-CH₃

MP-3: R⁷¹, R⁷²: -CH₃; R⁷³, R⁷⁵, R⁷⁶: -CH₂-NH-CO-CH=CH₂; R⁷⁴: -CH₂-NH-CO-(CH₂)₈-CH₃

MP-4: R⁷¹: -Ph; R⁷³, R⁷⁵, R⁷⁶: -CH₂-NH-CO-CH=CH₂; R⁷⁴: -CH₂-NH-CO-(CH₂)₈-CH₃

MP-5: R⁷³, R⁷⁶: -CH₂-NH-CO-CH=CH₂; R⁷⁴: -CH₂-NH-CO-(CH₂)₇-CH=CH-(CH₂)₇-CH₃; R⁷⁵: -CH₂-O-CH₃

MP-6: R⁷³, R⁷⁶: -CH₂-NH-CO-CH=CH₂; R⁷⁴: -CH₂-NH-CO-(CH₂)₇-CH=CH-(CH₂)₇-CH₃; R⁷⁵: -CH₂-OH

MP-7: R⁷³, R⁷⁶: -CH₂-NH-CO-C₂H₅; R⁷⁴: -CH₂-NH-CO-(CH₂)₁₆-CH₃; R⁷⁵: -CH₂-O-CH₃

MP-8: R⁷³, R⁷⁶: -CH₂-NH-CO-C₂H₅; R⁷⁴: -CH₂-NH-CO-(CH₂)₁₆-CH₃; R⁷⁵: -CH₂-OH

MP-9: R⁷³, R⁷⁶: -CH₂-O-CO-CH=CH₂; R⁷⁴: -CH₂-O-CO-(CH₂)₇-CH=CH-(CH₂)₇-CH₃; R⁷⁵: -CH₂-O-CH₃

MP-10: R⁷³, R⁷⁶: -CH₂-O-CO-CH=CH₂; R⁷⁴: -CH₂-O-CO-(CH₂)₇-CH=CH-(CH₂)₇-CH₃; R⁷⁵: -CH₂-OH

MP-11: R⁷³, R⁷⁶: -CH₂-O-CO-(CH₂)₇-CH=CH-(CH₂)₇-CH₃; R⁷⁴: -CH₂-NH-CO-(CH₂)₇-CH=CH-(CH₂)₇-CH₃; R⁷⁵: -CH₂-O-CH₃

MP-12: $R^{73}, R^{76}: -CH_2-O-CO-(CH_2)_7-CH=CH-(CH_2)_7-CH_3$; $R^{74}: -CH_2-NH-CO-(CH_2)_7-CH=CH-(CH_2)_7-CH_3$; $R^{75}: -CH_2-OH$

MP-13: $R^{73}, R^{74}, R^{75}, R^{76}: -CH_2-O-(CH_2)_{11}-O-CO-CH=CH_2$

MP-14: $R^{73}, R^{75}, R^{76}: -CH_2-NH-CO-CH=CH_2$; $R^{74}: -CH_2-O-(CH_2)_{16}-CH_3$

(註) 定義のないR: 無置換(水素原子)

Ph: フェニル

【0116】二種類以上の1, 3, 5-トリアジン環を有する化合物(メラミン化合物およびメラミンポリマーを含む)を併用してもよい。1, 3, 5-トリアジン環を有する化合物は、ディスコティック液晶性分子の量の0.01乃至20重量%の量で使用するが好ましく、0.1乃至15重量%の量で使用するがさらに好ましく、0.5乃至10重量%の量で使用するが最も好ましい。1, 3, 5-トリアジン環を有する化合物の塗布量は、1乃至1000mg/m²の範囲であることが好ましく、2乃至300mg/m²の範囲であることがさらに好ましく、3乃至100mg/m²の範囲であることが最も好ましい。

【0117】光学異方性層は、ディスコティック液晶性分子あるいは下記の重合性開始剤や任意の添加剤(例、可塑剤、モノマー、界面活性剤、セルロースエステル、1, 3, 5-トリアジン化合物、カイラル剤)を含む液晶組成物(塗布液)を、配向膜の上に塗布することで形成する。液晶組成物の調製に使用する溶媒としては、有機溶媒が好ましく用いられる。有機溶媒の例には、アミド(例、N, N-ジメチルホルムアミド)、スルホキシド(例、ジメチルスルホキシド)、ヘテロ環化合物(例、ピリジン)、炭化水素(例、ベンゼン、ヘキサン)、アルキルハライド(例、クロロホルム、ジクロロメタン)、エステル(例、酢酸メチル、酢酸ブチル)、ケトン(例、アセトン、メチルエチルケトン)、エーテル(例、テトラヒドロフラン、1, 2-ジメトキシエタン)が含まれる。アルキルハライドおよびケトンが好ましい。二種類以上の有機溶媒を併用してもよい。液晶組成物の塗布は、公知の方法(例、ワイヤーバーコーティング法、押し出しコーティング法、ダイレクトグラビアコーティング法、リバースグラビアコーティング法、ダイコーティング法)により実施できる。

【0118】ディスコティック液晶性分子の重合反応には、熱重合開始剤を用いる熱重合反応と光重合開始剤を用いる光重合反応とが含まれる。光重合反応が好ましい。光重合開始剤の例には、 α -カルボニル化合物(米国特許2367661号、同2367670号の各明細書記載)、アシロインエーテル(米国特許2448828号明細書記載)、 α -炭化水素置換芳香族アシロイン化合物(米国特許2722512号明細書記載)、多核キノン化合物(米国特許3046127号、同2951

758号の各明細書記載)、トリアリールイミダゾールダイマーとp-アミノフェニルケトンとの組み合わせ(米国特許3549367号明細書記載)、アクリジンおよびフェナジン化合物(特開昭60-105667号公報、米国特許4239850号明細書記載)およびオキサジアゾール化合物(米国特許4212970号明細書記載)が含まれる。光重合開始剤の使用量は、塗布液の固相分の0.01乃至20重量%であることが好ましく、0.5乃至5重量%であることがさらに好ましい。ディスコティック液晶性分子の重合のための照射は、紫外線を用いることが好ましい。照射エネルギーは、20mJ/cm²乃至50J/cm²であることが好ましく、100乃至800mJ/cm²であることがさらに好ましい。光重合反応を促進するため、加熱条件下で光照射を実施してもよい。光学異方性層の厚さは、0.1乃至20 μ mであることが好ましく、0.5乃至15 μ mであることがさらに好ましく、1乃至10 μ mであることが最も好ましい。

【0119】[偏光膜] 偏光膜には、ヨウ素系偏光膜、二色性染料を用いる染料系偏光膜やポリエン系偏光膜がある。ヨウ素系偏光膜および染料系偏光膜は、一般にポリビニルアルコール系フィルムを用いて製造する。偏光膜の偏光軸は、フィルムの延伸方向に垂直な方向に相当する。偏光膜の面内の透過軸は、透明支持体の遅相軸と、実質的に平行または直交するように配置することが好ましい。

【0120】[透明保護膜] 透明保護膜としては、透明なポリマーフィルムが用いられる。保護膜が透明であるとは、光透過率が80%以上であることを意味する。透明保護膜としては、一般にセルロースエステルフィルム、好ましくはトリアセチルセルロースフィルムが用いられる。セルロースエステルフィルムは、ソルベントキャスト法により形成することが好ましい。透明保護膜の厚さは、20乃至500 μ mであることが好ましく、50乃至200 μ mであることがさらに好ましい。

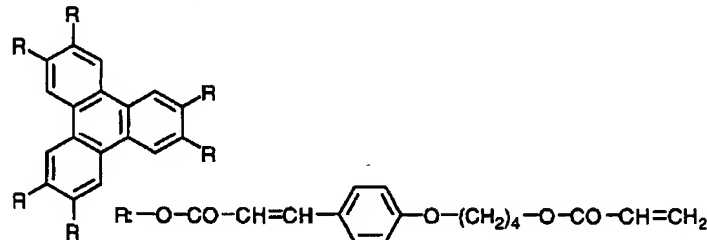
【0121】[液晶表示装置] 本発明は、様々な表示モードの液晶セルに適用できる。前述したように、液晶性分子を用いた光学補償シートは、TN (Twisted Nematic)、IPS (In-Plane Switching)、FLC (Ferroelectric Liquid Crystal)、OCB (Optically Compensatory Bend)、STN (Super Twisted Nematic)、VA (Vertically Aligned)、ECB (Electrically Controlled Birefringence) およびHAN (Hybrid Aligned Nematic) モードの液晶セルに対応するものが既に提案されている。本発明は、実質的に垂直に配向している棒状液晶性分子が多いVAモード、OCBモード、HANモードのような液晶セルを用いた液晶表示装置において有効であり、大部分の棒状液晶性分子が実質的に垂直に配向しているVAモードの液晶表示装置において特に効果がある。VAモードの液晶セルには、(1) 棒状液

晶性分子を電圧無印加時に実質的に垂直に配向させ、電圧印加時に実質的に水平に配向させる狭義のVAモードの液晶セル（特開平2-176625号公報記載）に加えて、（2）視野角拡大のため、VAモードをマルチドメイン化した（MVAモードの）液晶セル（SID97、Digest of tech. Papers（予稿集）28（1997）845記載）、（3）棒状液晶性分子を電圧無印加時に実質的に垂直配向させ、電圧印加時にねじれマルチドメイン配向させるモード（n-ASMモード）の液晶セル（日本液晶討論会の予稿集58～59（1998）10記載）および（4）SURVIVALモードの液晶セル（LCDインターナショナル98で発表）が含まれる。

【0122】

【実施例】[実施例1]

ディスコティック液晶性化合物（1）



【0124】塗布液を下塗り層の上に塗布、乾燥した。130℃で2分間加熱して、ディスコティック液晶性分子を配向させた。直ちに室温に冷却し、500mJ/cm²の紫外線を照射して、ディスコティック液晶性分子を重合させ、配向状態を固定した。形成した光学異方性層の厚さは、1.7μmであった。光学異方性層のレターデーションの角度依存性を、エリプソメーター（日本分光（株）製）で測定した。その結果、ディスコティック液晶性分子の平均傾斜角は0.2°、厚み方向のレターデーション（Rth）は88nmであった。

【0125】セルローストリアセテートフィルムのお互の面に、粘着剤を用いて、光学的一軸性を有するポリカーボネートフィルムを貼り合わせて光学補償シートを作製した。光学的一軸性を有するポリカーボネートフィルムは、面内に光軸を有し、面内レターデーション（Re）は50nm、厚み方向のレターデーションは 40 nmであった。作製した光学補償シート全体の面内レターデーション（Re）は50nm、厚み方向のレターデーション（Rth）は100nmであった。

【0126】（楕円偏光板の作製）光学補償シートの透明支持体（ポリカーボネートフィルム）側に、偏光膜と透明保護膜とをこの順に積層して、楕円偏光板を作製した。透明支持体の遅相軸と偏光膜の偏光軸とは平行になるように配置した。

【0127】（液晶表示装置の作製）市販のVA液晶表示装置（LCD5000）から楕円偏光板を削除し、代※50

*（光学補償シートの作製）セルローストリアセテートフィルム的一方の面に、セルロースジアセテートを塗布し、乾燥して、乾燥膜厚が0.5μmの下塗り層（ラビング処理していない配向膜）を形成した。下記のディスコティック液晶性分子（1）90重量部、エチレンオキサイド変性トリメチロールプロパントリアクリレート（V#360、大阪有機化学（株）製）10重量部、メラミンホルムアルデヒド/アクリル酸コポリマー（アルドリッチ試薬）0.6重量部、光重合開始剤（イルガキュア907、日本チバガイギー（株）製）3.0重量部および光増感剤（カヤキュアDET-X、日本化薬（株）製）1.0重量部を、メチルエチルケトンに溶解して、固形分濃度が38重量%の塗布液を調製した。

【0123】

【化34】

※わりに作製した楕円偏光板を貼り付けた。作製したVA液晶表示装置について、全方位のコントラストデータを測定したところ、コントラスト比20:1が得られる視野角は、上下左右160°であった。これに対して、市販のVA液晶表示装置（LCD5000）において、コントラスト比20:1が得られる視野角は、上下左右120°であった。

【0128】[実施例2]

（光学的二軸性透明支持体の作製）セルローストリアセテート87重量部、トリフェニルフォスフェート10重量部および紫外線吸収剤（TM165、住友化学（株）製）3重量部をメチレンクロライドに溶解して、固形分濃度が18重量%の溶液を調製した。溶液をガラス板の上に流延し、40℃で20分間乾燥した。形成したフィルム（厚さ：100μm）をガラス板から剥離した。作製したセルローストリアセテートフィルムに、145℃で10分間、20Kg/mm²の応力を加えた。このようにして、面内レターデーション（Re）が20nm、厚み方向のレターデーション（Rth）が80nmである光学的二軸性透明支持体を作製した。

【0129】（光学補償シートの作製）実施例1で用いた光学異方性層の塗布液を、光学的二軸性透明支持体の上に、3ml/m²塗布し、室温で乾燥した。130℃で1分間加熱して、ディスコティック液晶性分子を配向させ、紫外線を照射して、ディスコティック液晶性分子を重合させ、配向状態を固定した。光学異方性層のレタ

チロールプロパントリアクリレート(V#360、大阪有機化学(株)製)10重量部、メラミンホルムアルデヒド/アクリル酸コポリマー(アルドリッチ試薬)0.6重量部、光重合開始剤(イルガキュア907、日本チバガイギー(株)製)3.0重量部および光増感剤(カヤキュア-DETX、日本化薬(株)製)1.0重量部を、メチルエチルケトン170重量部に溶解して、塗布液を調製した。塗布液を配向膜の上に塗布、乾燥した。130℃で1分間加熱して、ディスコティック液晶性分子を配向させた。さらに紫外線を照射して、ディスコティック液晶性分子を重合させ、配向状態を固定した。形成した光学異方性層の厚さは、1.2μmであった。波長633nmにおける光学補償シート全体のレターデーションを、エリアソメーター(M150、日本分光(株)製)で測定した。その結果、面内レターデーション(Re)は40m、厚み方向のレターデーション(Rth)は160nmであった。

【0142】(楕円偏光板の作製)光学補償シートの透明支持体側に、偏光膜と透明保護膜とをこの順に積層して、楕円偏光板を作製した。透明支持体の遅相軸と偏光膜の偏光軸とは平行になるように配置した。

【0143】(液晶表示装置の作製)市販のMVA液晶表示装置(VL-1530S、富士通(株)製)から偏光板を削除し、代わりに作製した楕円偏光板を貼り付けた。作製したMVA液晶表示装置について、画像反転なしでコントラスト比10:1が得られる視野角を測定した。結果は、第1表に示す。

【0144】[実施例5]

(光学的二軸性透明支持体の作製)ノルボルネン樹脂(アートン、JSR(株)製)30重量部を、塩化メチレン70重量部に溶解した。得られた溶液をバンド流延機を用いて流延し、乾燥後の厚さが100μmのノルボルネンフィルムを作製した。ノルボルネンフィルムを長手方向に実質延伸倍率15%で延伸し、さらに幅方向に実質延伸倍率7%で延伸し、光学的二軸性透明支持体を作製した。波長633nmにおける透明支持体のレターデーションを、エリアソメーター(M150、日本分光(株)製)で測定した。その結果、厚み方向のレターデーション(Rth)は45nm、面内レターデーション(Re)は40nmであった。

【0145】(光学補償シートの作製)透明支持体の一方の面を、コロナ放電処理した。コロナ放電処理した面の上に、実施例4で用いた変性ポリビニルアルコール2重量%およびグルタルアルデヒド0.1重量%の水溶液を塗布、乾燥して、厚さ0.5μmの配向膜を形成した。実施例1で用いたディスコティック液晶性分子

(1)90重量部、エチレンオキサイド変性トリメチロールプロパントリアクリレート(V#360、大阪有機化学(株)製)10重量部、メラミンホルムアルデヒド/アクリル酸コポリマー(アルドリッチ試薬)0.6重

量部、光重合開始剤(イルガキュア907、日本チバガイギー(株)製)3.0重量部および光増感剤(カヤキュア-DETX、日本化薬(株)製)1.0重量部を、メチルエチルケトン170重量部に溶解して、塗布液を調製した。塗布液を配向膜の上に塗布、乾燥した。130℃で1分間加熱して、ディスコティック液晶性分子を配向させた。さらに紫外線を照射して、ディスコティック液晶性分子を重合させ、配向状態を固定した。形成した光学異方性層の厚さは、1.4μmであった。波長633nmにおける光学補償シート全体のレターデーションを、エリアソメーター(M150、日本分光(株)製)で測定した。その結果、面内レターデーション(Re)は30m、厚み方向のレターデーション(Rth)は120nmであった。

【0146】(楕円偏光板の作製)光学補償シートの透明支持体側に、偏光膜と透明保護膜とをこの順に積層して、楕円偏光板を作製した。透明支持体の遅相軸と偏光膜の偏光軸とは平行になるように配置した。

【0147】(液晶表示装置の作製)市販のMVA液晶表示装置(VL-1530S、富士通(株)製)から偏光板を削除し、代わりに作製した楕円偏光板を貼り付けた。作製したMVA液晶表示装置について、画像反転なしでコントラスト比10:1が得られる視野角を測定した。結果は、第1表に示す。

【0148】[実施例6]

(光学的二軸性透明支持体の作製)市販のポリカーボネートフィルム(帝人(株)製)を長手方向に実質延伸倍率40%で延伸し、さらに幅方向に実質延伸倍率15%で延伸し、光学的二軸性透明支持体を作製した。波長633nmにおける透明支持体のレターデーションを、エリアソメーター(M150、日本分光(株)製)で測定した。その結果、厚み方向のレターデーション(Rth)は100nm、面内レターデーション(Re)は200nmであった。

【0149】(光学補償シートの作製)透明支持体の一方の面を、コロナ放電処理した。コロナ放電処理した面の上に、実施例4で用いた変性ポリビニルアルコール2重量%およびグルタルアルデヒド0.1重量%の水溶液を塗布、乾燥して、厚さ0.5μmの配向膜を形成した。実施例1で用いたディスコティック液晶性分子

(1)90重量部、エチレンオキサイド変性トリメチロールプロパントリアクリレート(V#360、大阪有機化学(株)製)10重量部、メラミンホルムアルデヒド/アクリル酸コポリマー(アルドリッチ試薬)0.6重量部、光重合開始剤(イルガキュア907、日本チバガイギー(株)製)3.0重量部および光増感剤(カヤキュア-DETX、日本化薬(株)製)1.0重量部を、メチルエチルケトン170重量部に溶解して、塗布液を調製した。塗布液を配向膜の上に塗布、乾燥した。130℃で1分間加熱して、ディスコティック液晶性分子を

配向させた。さらに紫外線を照射して、ディスコティック液晶性分子を重合させ、配向状態を固定した。形成した光学異方性層の厚さは、 $3.5\mu\text{m}$ であった。波長633nmにおける光学補償シート全体のレターデーションを、エリプソメーター(M150、日本分光(株)製)で測定した。その結果、面内レターデーション(Re)は200nm、厚み方向のレターデーション(Rth)は300nmであった。

【0150】(楕円偏光板の作製)光学補償シートの透明支持体側に、偏光膜と透明保護膜とをこの順に積層して、楕円偏光板を作製した。透明支持体の遅相軸と偏光膜の偏光軸とは平行になるように配置した。

【0151】(液晶表示装置の作製)市販のMVA液晶表示装置(VL-1530S、富士通(株)製)から偏光板を削除し、代わりに作製した楕円偏光板を貼り付けた。作製したMVA液晶表示装置について、画像反転なしでコントラスト比10:1が得られる視野角を測定した。結果は、第1表に示す。

【0152】[比較例1]

(光学的等方性透明支持体の作製)市販のセルローストリアセテートフィルム(富士写真フィルム(株)製)を透明支持体として用いた。波長633nmにおける透明支持体のレターデーションを、エリプソメーター(M150、日本分光(株)製)で測定した。その結果、厚み方向のレターデーション(Rth)は40nm、面内レターデーション(Re)は3nmであり、実質的に光学的等方性であった。

【0153】(光学補償シートの作製)透明支持体の一方の面に、ゼラチンを塗布して下塗り層を形成した。下塗り層の上に、実施例4で用いた変性ポリビニルアルコール2重量%およびグルタルアルデヒド0.1重量%の水溶液を塗布、乾燥して、厚さ $0.5\mu\text{m}$ の配向膜を形成した。実施例1で用いたディスコティック液晶性分子(1)90重量部、エチレンオキサイド変性トリメチロ*

*ールプロバントリアクリレート(V#360、大阪有機化学(株)製)10重量部、メラミンホルムアルデヒド/アクリル酸コポリマー(アルドリッチ試薬)0.6重量部、光重合開始剤(イルガキュア907、日本チバガイギー(株)製)3.0重量部および光増感剤(カヤキュア-DETX、日本化薬(株)製)1.0重量部を、メチルエチルケトン170重量部に溶解して、塗布液を調製した。塗布液を配向膜の上に塗布、乾燥した。130℃で1分間加熱して、ディスコティック液晶性分子を配向させた。さらに紫外線を照射して、ディスコティック液晶性分子を重合させ、配向状態を固定した。形成した光学異方性層の厚さは、 $2.0\mu\text{m}$ であった。波長633nmにおける光学補償シート全体のレターデーションを、エリプソメーター(M150、日本分光(株)製)で測定した。その結果、面内レターデーション(Re)は3nm、厚み方向のレターデーション(Rth)は240nmであった。

【0154】(楕円偏光板の作製)光学補償シートの透明支持体側に、偏光膜と透明保護膜とをこの順に積層して、楕円偏光板を作製した。透明支持体の遅相軸と偏光膜の偏光軸とは平行になるように配置した。

【0155】(液晶表示装置の作製)市販のMVA液晶表示装置(VL-1530S、富士通(株)製)から偏光板を削除し、代わりに作製した楕円偏光板を貼り付けた。作製したMVA液晶表示装置について、画像反転なしでコントラスト比10:1が得られる視野角を測定した。結果は、第1表に示す。

【0156】[参考例1]市販のMVA液晶表示装置(VL-1530S、富士通(株)製)について、画像反転なしでコントラスト比10:1が得られる視野角を測定した。結果は、第1表に示す。

【0157】

【表1】

第1表

MVA液晶 表示装置	光学補償シートのレターデーション		視野角	
	Re	Rth	上下左右	斜め上下左右
実施例4	40nm	160nm	80°	80°
実施例5	30nm	120nm	80°	75°
実施例6	200nm	300nm	80°	60°
比較例1	3nm	240nm	80°	55°
参考例1	光学補償シートなし		80°	45°

【図面の簡単な説明】

【図1】透過型液晶表示装置の基本的な構成を示す模式図である。

【図2】反射型液晶表示装置の基本的な構成を示す模式図である。

※【符号の説明】

BR バックライト

RP 反射板

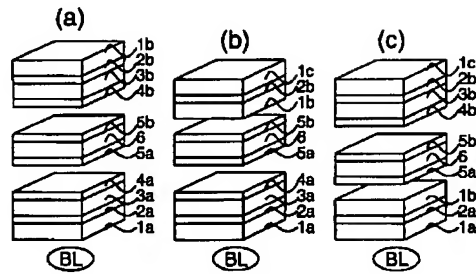
1、1a、1b、1c 透明保護膜

※50 2、2a、2b 偏光膜

3、3a、3b 透明支持体
 4、4a、4b 光学異方性層
 5a 液晶セルの下基板

5b 液晶セルの上基板
 6 棒状液晶性分子

【図1】



【図2】

